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STATE OF ARIZONA
DEPARTMENT OF MINES AND MINERAL RESOURCES
Phoenix, Arizona

John H. Jett, Director

THE PRIMARY COPPER INDUSTRY OF ARIZONA IN 1986

Special Report Number 13

By
Richard R. Beard, Mining Engineer
December 1987

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Certain specific statistics may vary slightly from Table to Table. This is due to differences in their source.

INTRODUCTION

The Arizona Department of Mines and Mineral Resources presents herein a report covering activity in Arizona's copper industry in the calendar year 1986. A brief review of operational highlights reported by the major developers and producers in the State, market and price developments which affected copper production and discussions of Arizona severance taxes on metalliferous minerals are included.

The contained statistical tables include various production, employment, inventory, import/export, prices, costs and ore reserve numbers for 1986. Production of recoverable copper is given for individual mines and by company. Figures showing the importance of copper in the mining industry are provided, as are data on the by-products of copper mining; gold, silver and molybdenum. In addition, historical compilations are included for leach copper, average grade of ore produced, percent copper recovered, open pit mine stripping ratios, and employment and earnings. Additional compilations indicating refined copper inventories in and out of the United States and average copper prices by month from 1977 through 1986 are provided. Also included are tables showing designed mine capacity and copper reserves in Arizona plus average copper cash production costs for the United States, 1981-1985.

The Department maintains extensive reference libraries in its Phoenix and Tucson offices concerning the copper industry in Arizona. These repositories include information on individual mines and mining companies, United States Bureau of Mines and United States Geological Survey publications, other professional publications and periodicals and earlier editions of this report. Additionally, experienced mining engineers are available for consultation, at no charge, on matters germane to the minerals industry. Office hours are 8 a.m. to 5 p.m. on all non-holiday weekdays.

COPPER PRODUCTION IN ARIZONA - 1986

Arizona's copper industry produced 876,262 tons of copper in 1986 (Table I). This is a decrease of 1.5% below 1985 and 18.3% below the record production of 1981 (Table IX). Arizona's share of the United States Total was 67.8% (Table XXIV).

The gross value of non-fuel mineral production in Arizona in 1986 was up 1.0% over 1985 to $1,566,292 (preliminary) (Table X). Copper production represents 74.4% of this total and the by-products of copper production (gold, silver and molybdenum) represent an additional 7.6% (Table IX). The total contribution of the copper mines was therefore 82% of the gross value.

Copper was produced by eight companies from twelve properties in 1986 and molybdenum was recovered as a co-product or by-product at five of these properties (Tables III & IV). Eight properties produced 98.8% of Arizona's copper and four produced 98.1% of the molybdenum. The Morenci-Metcalf mine of Phelps Dodge led in copper production with 32.8% of the total and the Sierrita-Esperanza complex produced 56.2% of the molybdenum.

Almost 150,000 tons of copper representing 17.1% of the total was produced by leaching in 1986. Solvent Extraction-Electrowinning produced almost 100,000 tons of cathode copper from these leach solutions. The remaining 50,000 tons were precipitated as cement copper (Table I).

Stripping of waste, including some leachable material, was accomplished at the eight operating open pit mines during 1986. The weighted average of the stripping ratios - waste to ore - was .96 to 1 (Table VIII). This is an increase from .88 to 1 in 1985 which probably indicates normal long range mine planning.

The weighted average grade - percent copper - of sulfide ores mined in 1986 was .61% copper (Table VI). This is also the average of the last ten years and reflects the stability of the copper industry.

The estimated capacity to produce copper at each of Arizona's principal operations totals 1.402 million tons annually (Table XI). By this estimate the mines, concentrators and leach facilities operated at 84% of capacity in 1986.

The copper reserve base in Arizona by company and property is estimated in Table XIII. The reserve base as defined in "Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3 includes those resources that are currently economic (reserves), marginally economic (marginal reserves) and some of those that are currently sub-economic (sub-economic reserves). The many technical, political, social and economic variables render a listing of actual economic reserves inappropriate.

1986 OPERATIONS SUMMARY

Operating Properties	12
Operating Companies	8
Operating Smelters	4
Ore Mined (Includes some oxide)	167,808,000 tons
Ore Milled (sulfide)	146,717,000 tons
Waste/Overburden Removed (includes some leach material)	136,952,000 tons
Average Stripping Ratio	.96:1
Copper Produced	876,252 tons - 67.8% of U.S.
From Sulfide Ores	726,178 tons - 82.9% of AZ
Average Grade	.61% copper
From Leaching	150,085 tons - 17.1% of AZ
SX-EW	98,322 tons - 65.5% of Leached
Precipitation	51,763 tons - 34.5% of Leached
Molybdenum Produced	27,805,000 pounds
Silver Produced	4,812,000 troy ounces
Gold Produced	63,334 troy ounces
Average Employment	10,848
Average Annual Wage	$30,136
Productivity	121 pounds of copper per man-hour
	11.6 tons of ore per man-hour

STATUS AND PROGRESS

The trends established in 1985 continued through 1986. The independent companies with mining industry management continued to buy up troubled properties at bargain rates. Investment in equipment and operational changes to increase efficiency continued. Refined copper inventories continued their slow descent and at the time of this writing (Oct. 1987) there is actually a shortage of immediately available cathode. The price of copper remained reasonably steady during 1986 averaging about three percent lower than 1985. Responding to the shortage of cathode the prices have been increasing in 1987 and are now in the plus eighty cent range.

In this typically boom and bust industry those producers who reduced their costs to or near the break-even point during the '85-'86 depressed market without gutting their reserves, are now in a position to take advantage of the improvement in prices. Black ink is spreading across the industry like a tidal wave. Hopefully the parasites will leave it alone so that there will be some cushion when the black ink tide inevitably ebbs.

As indicated above, the trend toward consolidation of properties continued throughout the 1986 and thus far into 1987. As of this writing there are five companies operating the twelve active or semi-active properties that produced during 1986. However, another company and property will be joining their ranks in 1988. Adhering to the old saying that "one must spend money to make money", the surviving operators are investing in improved processes and equipment.

OPEN PIT MINING

The majority of the copper is produced by open pit mining methods. So far most of the improved efficiency has been the result of consolidatien, preplanned maintenance, scheduling and utilization of equipment. The computer dispatching at Morenci is but one example of this. Now, however, major changes in operating methods are being considered.

At Morenci, Phelps Dodge has gone from an all rail haulage system to a system using trucks to service the shovels and haul to in-pit transfer points for rail haulage to the concentrators and distant dumps. With the purchase of the conveyor system from Anamax's closed Twin Buttes mine, rail haulage will be phased out completely.

Magma has brought its open pit mine for the oxide ore overlying the main sulfide orebody at San Manuel on line and it is now in production.

Cyprus has acquired Duval's properties and is increasing production at the Sierrita-Esperanza property to add to its continuing production at Bagdad.

Asarco purchased the Ray Mines Division from Kennecott to supplement its in-house production of concentrates to feed its Hayden Smelter.

UNDERGROUND MINING

At San Manuel, the only operating underground copper mine in Arizona, Magma is showing signs of optimism by continuing to invest in the development of the Kalamazoo ore body. Development of Asarco's underground ore body at Sacaton and Phelps Dodge's Safford property has been suspended indefinitely and no other underground development is under consideration in Arizona.

STATUS AND PROGRESS (CONT)

IN SITU MINING

In situ leaching of rubbleized copper bearing material remaining in mined out underground stopes has long been practiced in Arizona. At San Manuel, Magma is developing a more formalized program of leaching mined out block caving stopes and is approaching production status. During the last few years all of the production from the Lakeshore property has been from a similar system developed by Noranda. Cyprus is continuing this project as well as the tests initiated by Noranda into in situ leaching of non-rubbleized or virgin ground. Kocide Chemical is also planning to produce copper from the Van Dyke property at Miami in this fashion taking advantage of the test work conducted by Oxymin.

The U.S. Bureau of Mines is funding tests of in situ leaching of virgin ground in Arizona. Science Applications International Corporation has been awarded a contract to identify analytical procedures and develop computer algorithms that could be used to select the best in situ mining method for any specific copper oxide deposit. Cyprus is cooperating in this study at Cyprus Casa Grande (Lakeshore) and Asarco is cooperating at the Santa Cruz property near Casa Grande. The Santa Cruz ore body is a deep seated oxide deposit which is owned by Asarco and Freeport McMoran on a 50-50 basis.

CONCENTRATION

The overwhelming majority of copper mineralization in Arizona is of the sulfide type and is not amenable to leaching without extraordinary means. Inspiration has had success with its heap leach-ferric cure process on mixed oxide-sulfide ores and Kennecott pioneered the use of bacteria to convert sulfides to oxides in low grade dumps. However, as shown in Table I, about 85% of the copper was produced by the flotation method of concentration. In addition much of the leached copper produced is from dumps of "waste" which was stripped from open pit mines to provide access to sulfide ore. Another aspect of the flotation process that makes it viable at some properties is the recovery of molybdenum by selective flotation. Molybdenum provides a significant portion of the revenues from some properties. Also any precious metals in the ore follow the copper through the flotation process and smelting to the electrolytic refinery where they can be recovered from the anode slimes.

There are currently eight flotation concentrators in operation in Arizona. Asarco is operating two - Ray and Mission, Cyprus is operating two - Bagdad and Sierrita, Magma is operating two - San Manuel and Pinto Valley and Phelps Dodge is operating two at Morenci-Metcalf. Five are on standby. They are Asarco's at Silver Bell, Cyprus' at Mineral Park and Esperanza, Inspiration's at Miami and Phelps Dodge's at Ajo.

Although efficiency is constantly being improved, the flotation process is not cheap. It requires crushing and grinding the ore, separation of the ore minerals from the gangue minerals in the flotation cells, smelting the concentrate and refining the copper anodes from the smelter.

STATUS AND PROGRESS (CONT)

SOLVENT EXTRACTION

Traditionally the copper produced from leach solutions has been extracted by the cementation process (precipitation from solution by the replacement of copper in solution by metallic iron). This has been a source of relatively cheap copper but the cement copper produced must be smelted and refined along with the flotation concentrates.

During the sixties Ranchers Exploration and Development Corporation pioneered the use of solvent extraction-electrowinning to produce copper from its Bluebird property near Miami. The obvious advantage of this method is that cathode copper of salable quality can be produced directly from leach solutions. Smelting, with its pollution problems, and further refining are therefore not required.

During the relatively good years experienced by the industry after Ranchers' introduction of solvent extraction-electrowinning, interest in the process grew gradually. The disastrous eighties have prompted an accelerated interest in it, however. Seven plants operated during 1986, one is being moved from Cyprus Johnson to Cyprus Sierrita and the plant at Morenci is just coming on line. Several expansions or new plants are planned and the cementation process is being phased out except as a subsidiary method.

SMELTING

Of the seven smelters in Arizona in 1986 only four operated. Now only three are in operation. Asarco's Hayden smelter and Inspiration's smelter at Miami have been brought into compliance with air pollution constraints and Magma's smelter at San Manuel is being retrofitted with an OutoKumpu flash furnace to bring it into compliance. The Ray smelter at Hayden that Asarco acquired from Kennecott met all significant environmental constraints when last operated in 1982 and is available if needed. Phelps Dodge's smelters at Ajo and Morenci will require extensive retrofitting before they can be operated and their smelter at Douglas has been permanently shut down in lieu of retrofitting. Phelps Dodge is shipping concentrates to is Hidalgo smelter at Playas, New Mexico and to the Chino smelter at Hurley, New Mexico that was recently acquired from Kennecott. Excess concentrates are being sold.

As an alternative to smelting, Cyprus Casa Grande is planning to reactivate the Roast-Leach-Electrowinning (RLE) plant built by Hecla at the Lakeshore property. In this process flotation concentrates are roasted to make them acid soluble, leached with sulfuric acid and salable cathode copper is extracted from solution by electrowinning. Acid is produced from the roaster gases and the process is essentially pollution free. A portion of the concentrates from Sierrita will be processed at this plant.

PROGNOSTICATION

Barring the advent of a major recession, Arizona's copper industry will remain healthy. The surviving companies all have optimistic, capable, innovative and aggressive management and workers who are dedicated to the survival and growth of their individual operations and of the industry as a whole.

ASARCO INCORPORATED

Corporate Headquarters - 180 Maiden Lane, New York, New York 10038 - Phone (212) 669-1000

Tucson Office - 1150 N. 7th Ave., P.O. Box 5747, Tucson, Arizona 85703 - Phone (602) 792-3010

The Tucson office houses the Southwestern Mining Department, Mineral Beneficiation Department, Exploration Department, Acid Sales Department and the Department of Safety and Technical Employment.

Hayden Unit - Box 98, Hayden, Arizona 85235 - Phone (602) 356-7804

The Hayden Unit consists of an oxygen flash smelter rated at 940,000 tons of charge per year for an estimated production of 175,000 tons of blister copper. An acid plant rated at 2,800 tons of sulfuric acid per day keeps sulfur dioxide emissions within air quality restraints.

Mission Unit - Box 111, Sahuarita, Arizona 85629 - Phone (602) 791-2920

The Mission Unit consists of the consolidation of the Mission, Eisenhower, San Xavier and Pima open pit mines into the "Mission Complex" and a 29,000 ton per day concentrator.

Ray Unit - P.O. Box 9, Hayden, Arizona 85235 - Phone (602) 356-7811

The Ray Unit consists of an open pit mine, dump leach-precipitation plant and heap leach-solvent extraction-electrowinning plant at Ray. The concentrator, rated at 41,000 tons per day is located at Hayden. The 400,000 ton per year smelter and 900 ton per day acid plant at Hayden are on standby but complied with all significant environmental regulations when last operated in 1982.

Silver Bell Unit - Marana, Arizona 85653 - Phone (602) 622-6751

The Silver Bell Unit consists of an open pit mine, an 11,000 ton per day concentrator and a dump leach-precipitation plant. The mine and concentrator are on standby and all production is from the leaching operation.

Company Activity

Asarco's major acquisition in 1986 was the Ray Mines Division of Kennecott Corporation in November. This added over 100,000 tons of copper production capacity and 400,000 tons of smelter capacity. The Hayden Smelter is treating all concentrates but the Ray Smelter is capable of meeting emission limits if and when additional capacity is required.

The production of cement copper at the Ray Unit by precipitation is being replaced with the expansion of the solvent extraction-electrowinning plant. The plants capacity is being increased to 40,000 tons of cathode copper per year. The mine plans are being modified to produce more leachable material.

ASARCO INCORPORATED (CONT)

The final link in the consolidation of the Mission Complex was accomplished by the acquisition of Anamax's share of the Palo Verde Deposit (Eisenhower Mining Co.).

Asarco is cooperating with the U.S. Bureau of Mines in a study of in situ mining at the Santa Cruz deposit near Casa Grande.

The company proposed to utilize the mined out open pit at the Sacaton Unit near Casa Grande for a state of the art regional landfill to alleviate the waste disposal crisis of Arizona's two urban areas. The deep "underground reserves" would not be affected. The technical problems are minor compared to the political and sociological problems.

CYPRUS METALS COMPANY

Corporate Headquarters - 7200 S. Alton Way, P.O. Box 3299, Englewood, Colorado 80155 - Phone (303) 740-5000

Cyprus Bagdad - P.O. Box 245, Bagdad, Arizona 86321 - Phone (602) 633-2241

The Cyprus Bagdad operation consists of an open pit copper-molybdenum mine, a 54,000 ton per day concentrator and a dump leach-solvent-extraction-electrowinning plant.

Cyprus Sierrita - P.O. Box 527, Green Valley, Arizona 85622 - Phone (602) 791-2950 and 625-4800

Cyprus Sierrita consists of the Sierrita open pit copper-molybdenum mine and 100,000 ton per day concentrator, the Esperanza open pit copper-molybdenum mine and 17,500 ton per day concentrator, dump leach-precipitation plant, ferromolybdenum plant and rhenium plant. The Sierrita mine and concentrator are being operated with only the crushing circuit of the Esperanza concentrator operating to supplement the crushing circuit at Sierrita. The solvent extraction electrowinning plant from the shut down Johnson property are being moved to the Sierrita operation.

Cyprus Mineral Park - P.O. Box 6249, Kingman, Arizona 86401 - Phone (602) 565-2226

Cyprus Mineral Park consists of an open pit copper-molybdenum mine, a 15,000 ton per day concentrator and a dump leach-precipitation plant. The dump leach-precipitation plant is the only part currently in operation.

Cyprus Casa Grande - P.O. Box C-9, Casa Grande, Arizona 85222 - Phone (602) 836-2141

Cyprus Casa Grande consists of an in situ (rubbleized) leaching-solvent extraction-electrowinning operation in production. A 7000 ton per day vat leach plant and a 150,000 ton per year concentrate roast-leach-electrowinning plant are both on standby.

Company Activity

Since Cyprus Minerals Company was spun off by AMOCO in July 1985 and sold the Pima Mine to ASARCO to be integrated into the Mission Complex it has been in a growth mode. The purchase of Duval's copper-molybdenum operations in Arizona from Pennzoil effective April 1, 1986 made Cyprus one of the leading copper producers in the country and the leading molybdenum producer in Arizona. The acquisition of the Lakeshore property from Noranda in July 1987 will provide a small increase in copper capacity. More importantly, however, it will provide an outlet for a portion of copper concentrates from other properties.

Cyprus is now in the process of integrating the production of its separate operations to maximize the efficiency of each. The solvent extraction plant is being moved from the closed Johnson property to the Sierrita property to treat dump leach solutions. The increased molybdenum production has allowed them to drastically cut back on inefficient out of state molybdenum operations. By

utilizing the Roast-Leach-Electrowinning plant at the Cyprus Casa Grande (Lakeshore) property Cyprus will be able to produce cathode copper from about thirty percent of its concentrates from Sierrita and Bagdad. This will reduce their dependence on custom or toll smelters. Acid produced from the roaster gases will be used for the in situ leaching operation. Meanwhile the present in situ leaching of rubbleized ore at Lakeshore will be enhanced and a study of undisturbed in situ leaching will be conducted in cooperation with the U.S. Bureau of Mines.

In addition to its copper-molybdenum operations, Cyprus is bringing on line the Copperstone gold mine north of Quartzsite. When in operation Copperstone will double Arizona's gold production which is now principally a by-product of copper production.

INSPIRATION CONSOLIDATED COPPER COMPANY

Corporate Headquarters - 8655 E. Via de Ventura, Suite G-350, Scottsdale, Arizona 85258 - Phone (602) 998-0888

Inspiration Operations - P.O. Box 4444, Claypool, Arizona 85532 - Phone (602) 473-7006

The Inspiration properties consist of three open pit copper mines collectively called Inspiration Mines, a 120,000 ton per year smelter and acid plant, ferric cure dump leach, solvent-extraction-electrowinning, precipitation plant, a 24,000 ton per day concentrator with molybdenum circuit, an electrolytic refinery and a 100,000 ton per year continuous rod plant.

Company Activity

Inspiration ceased mining and suspended operation of the concentrator in January of 1986. Feed to the smelter is from stockpiled concentrates and toll custom concentrates. The dump leaching, solvent extraction-electrowinning, cementation plant, electrolytic refinery and rod plant all remained in operation.

MAGMA COPPER COMPANY

Corporate Headquarters - P.O. Box M, San Manuel, Arizona 85631 - Phone (602) 385-3100

San Manuel Division - P.O. Box M, San Manuel, Arizona 85631 - Phone (602) 385-3100

The San Manuel Division consists of a block-caving underground copper-molybdenum mine, a 62,000 ton per day concentrator, with molybdenum circuit, an open pit oxide copper mine, pad leach, solvent extraction-electrowinning plant, an 800,000 ton per year smelter with a 2,000 ton per day acid plant, a 200,000 ton per year electrolytic refinery and rod plant.

Pinto Valley Division - P.O. Box 100, Miami, Arizona 85539 - Phone (602) 425-7611

The Pinto Valley Division consists of an open pit copper-molybdenum mine, a 60,000 ton per day concentrator with molybdenum circuit, a dump leach-solvent extraction-electrowinning operation and an underground leach, solvent extraction-electrowinning operation. The Miami East underground project has been indefinitely postponed.

Company Activity

Magma became independent of Newmont, March 18, 1987. However, Newmont retained a fifteen percent ownership position. At that time financing had been secured and an air pollution consent decree had been extended to allow time to complete the installation of a flash smelting furnace in the place of number three reverb at the San Manuel smelter. The flash furnace is scheduled for start up in August 1988. An estimated production capacity of 300,000 tons of copper per year while meeting all air pollution restraints is anticipated.

At the San Manuel open pit oxide mine the solvent extraction-electrowinning plant went on line in May of 1986. The plant is being doubled in size to a design capacity of 50,000 tons of cathode copper per year to accommodate solutions from the in situ leaching project.

Development of the Kalamazoo ore body which is a deeper, faulted off section of the San Manuel ore body has been resumed. Production is scheduled to begin on the 2890/2950 levels during the first quarter of 1989.

Pinto Valley officially became a division of Magma on November 5, 1986. A pilot program to determine the feasibility of processing the old tailings from the Miami Copper Company concentrator proved successful. Financing arrangements and the permitting process have been initiated. The tailings will be slurried, leached and then be deposited in a mined out area of the open pit.

PHELPS DODGE CORPORATION

Corporate Headquarters - 2600 North Central Avenue, Phoenix, Arizona 85004 - Phone (602) 234-8100

Morenci Branch - Morenci, Arizona 85540 - Phone (602) 865-4521

The Morenci Branch consists of the combined Morenci-Metcalf open pit copper mine, the 60,000 ton per day Morenci concentrator with a molybdenum circuit, the 40,000 ton per day Metcalf concentrator, a 650,000 ton per year smelter with a 2,400 ton per day acid plant and a dump leach-precipitation operation. The smelter has been shut down since December, 1984 and will require modification to meet air quality restraints before reopening. Sumitomo Mining Arizona, Inc. holds an undivided 15% interest in the Morenci Branch excluding the inactive smelter.

Copper Queen Branch - Highway 92, Bisbee, Arizona 85603 - Phone (602) 432-3621

The Copper Queen operations consist of a dump leaching and precipitation operation.

New Cornelia Branch - Ajo, Arizona 85321 - Phone (602) 387-7451

The New Cornelia Branch consists of an open pit copper mine, a 30,000 ton per day concentrator with a molybdenum circuit and a 190,000 ton per year smelter with an acid plant. The mine has been inactive since August 1984 and the smelter was shut down in April 1985. There are no immediate plans to reactivate the operation.

Company Activity

A 50,000 ton per year solvent extraction-electrowinning plant is nearing completion at Morenci to treat dump leach solutions. A fifty percent increase in capacity is already under consideration. The precipitation plant will be phased out as solvent extraction capacity is increased.

Also at Morenci an in-pit crushing and belt conveyor system is planned. Rail haulage will be completely phased out with its completion. Trucks are currently used to haul from the shovels to transfer points for rail haulage to the concentrator and dumps.

At the Copper Queen Branch prospect drilling north of the Lavender pit during 1987 indicates the presence of an ore body which is amenable to heap leaching. Additional drilling will be conducted to define the ore body and the feasibility of installing a solvent extraction-electrowinning facility will be studied.

Development of an underground mine at the Dos Pobres property near Safford was suspended in 1982 and allowed to flood in August 1984 and remains inactive.

At Copper Basin near Prescott, Phelps Dodge has continued to pursue a land trade with the Forest Service. They have no plans to develop it at this time, however.

PHELPS DODGE CORPORATION (CONT)

At Douglas the classic old smelter was sacrificed on the alter of political expediency in January 1987. Arizona was thereby deprived of 425,000 tons per year of smelter capacity.

Because they are so closely related to their Arizona operations, a discussion of Phelps Dodge's New Mexico operations is appropriate. With the acquisition of Kennecott's two-thirds interest in the Chino Mines Branch in December 1986, Phelps Dodge assured its place as the number one copper producer in the country. This property added to the Tyrone property and the Hidalgo smelter makes Phelps Dodge and its partner in Chino the only major producers of copper in New Mexico. Mitsubishi Corporation refused an offer to sell its one-third interest in Chino on the same terms as Kennecott.

The Chino Mines Branch consists of an open pit copper mine, a 37,500 ton per day concentrator, a dump leach precipitation plant and a 500,000 ton per year INCO Flash smelter with an acid plant. A 35,000 ton per year solvent extraction-electrowinning plant is planned. The mine and concentrator are located at Santa Rita about fifteen miles east of Silver City and the smelter is located about nine miles south of the mine at Hurley.

At Tyrone, about ten miles south of Silver City, Phelps Dodge operates an open pit copper mine and concentrator which produced 123,900 tons of copper in concentrates and precipitates in 1986. The solvent extraction-electrowinning plant rated at 35,000 tons per year produced an additional 35,400 tons of copper in 1986. Expansion of the plant is in progress and further expansion is under consideration.

The Hidalgo smelter near Playas, New Mexico is an OutoKumpo flash furnace rated at 500,000 tons per year. During 1986 the oxygen enrichment plant from the Morenci smelter was installed to increase capacity and efficiency. The resulting increase in sulfur dioxide concentration of the gases improved the operation of the acid plant as well.

SEVERANCE TAX ON METALLIFEROUS MINERALS

Background

Laws of 1982, Chapter 230 repealed the tax on sales of metalliferous minerals and enacted a severance tax in its place. Under the provisions of the severance tax, metalliferous minerals were to be taxed at the time of production, not at the time of sale. All metalliferous minerals produced after 1982 were to be taxed on the greater of the following two values:

1. The "weighted mineral value" which is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed, or

2. A specified percentage of the old sales tax base.

The severance tax was to be levied on metalliferous minerals at a rate of 2 1/2 percent. Unless otherwise provided by law, the tax was to be administered in the same manner as the sales tax. As a result, severance tax payments were due on the first day of the second month following the month in which the tax accrued. From January 1, 1983 through June 30, 1983, 40 percent of the severance tax was to be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). In subsequent fiscal years, a progressively larger share of the severance tax was to be distributed in the same manner as the transaction privilege tax. The balance of severance tax collections, after making this distribution, was to be deposited each year in the state's general fund. (Effective from and after December 31, 1982.)

Laws of 1983, Chapter 4 changed the due date for payment of the Severance Tax to the twentieth day of the month following the month in which the tax accrues. Taxes were to be delinquent if not received by the Department of Revenue on the day preceding the last day of the month in which they were due. (Effective April 1, 1983). The law also changed the interest rate on delinquent tax payments to equal the rate established by Section 6621 of the Internal Revenue Code, compounded annually. (Effective February 11, 1983.)

Legal Citation

A.R.S. 42-1461 - 42-1466.

Paid by

Persons engaged in the business of extracting substances from the earth that become metalliferous minerals (A.R.S. 42-1461 - 42-1462.)

Exemptions

None.

SEVERANCE TAX ON METALLIFEROUS MINERALS (CONT)

Tax Base

The severance tax is levied on the "net severance base" of all metalliferous minerals produced after 1982 (42-1462). The "net severance base" is the greater of the following two values (42-1464, Laws of 1982, Chapter 230, Section 12):

1. The "weighted mineral value", or

2. A specified percentage of the old sales tax base (the gross value of production less out-of-state processing costs). This value will be referred to as the "Arizona value" after June 30, 1985.

The "weighted mineral value" is essentially the cost of extracting the minerals from the earth and delivering them to the site where they will be processed.

The "weighted mineral value" is determined using the following formula (42-1464):

$$\text{weighted mineral value} = \frac{\text{mining costs}}{\text{total production costs}} \times \text{gross value of production}$$

where:

mining costs represent the cost of extracting the minerals from the earth and delivering them to the site where they will be processed further (42-1461).

total production costs include most of the major costs incurred in mining and processing minerals until the point of sale (42-1461).

gross value of production is determined by multiplying the recoverable units of a metallic product by the per unit price of the product; the price per unit does not include the cost of manufacturing, fabricating or otherwise transforming a refined mineral product, when these activities occur prior to sale of the product (42-1461).

Although metalliferous minerals will no longer be taxed on the old sales tax base, the value of minerals produced after 1982 may not fall below a specified percentage of the old tax value (42-1464, Laws of 1982, Chapter 230, Section 12). The old tax value included not only the cost of extracting the minerals from the earth, but most of the major in-state costs of producing the minerals. This value was determined by multiplying the recoverable units of a metallic product by the per unit price and deducting the out-of-state processing costs from the result (42-1464; Laws of 1982, Chapter 230, Section 12; 41-1461). The following table shows the minimum percentage of the old tax value that may be assigned to minerals for severance tax purposes (42-1464; Laws of 1982, Chapter 230, Section 12):

Period during which minerals are produced	Minimum value of minerals for purposes of determining the severance tax
January 1, 1983 - June 30, 1983	100% of the old taxable sale value
July 1, 1983 - June 30, 1984	83-1/3% of the old taxable sale value
July 1, 1984 - June 30, 1985	66-2/3% of the old taxable sale value
July 1, 1985 and thereafter	50% of the old taxable sale value

SEVERANCE TAX ON METALLIFEROUS MINERALS (CONT)

Tax Rate

During fiscal years 1980-81, 1981-82 and 1982-83, businesses that produced mineral products were permitted to claim a tax credit against the Special Excise Tax for Education. The tax credit was determined by formula (see "TAX CREDIT" under "SPECIAL EXCISE TAX FOR EDUCATION"). The tax credit could not exceed the taxpayer's Special Excise Tax liability for the year. However, if a taxpayer had an unused amount of credit for any year in which his production was curtailed due to economic conditions, the unused credit could be carried forward for a period not to exceed three years. Since the Special Excise Tax does not apply to metalliferous minerals after December 31, 1982, businesses that produce metalliferous minerals are authorized to claim this tax credit against their severance tax liability, beginning in 1983. In 1982-83, the amount of credit claimed may not exceed 40 percent of the taxpayer's severance tax liability (Laws of 1982, Chapter 228, Section 2; Laws of 1982, Chapter 230, Section 15).

Due Date

Collections from the severance tax on metalliferous minerals are due on the twentieth day of the month following the month in which the tax accrues. Taxes are delinquent if they are not received by the Department of Revenue on the day preceding the last day of the month in which they are due. The due date may be extended by the Department of Revenue for good cause, but not beyond the first day of the third month following the regular due date (42-1465, 42-1322).

Collecting Agency

Department of Revenue. (42-1462, 42-101)

Dedication or Purpose

To aid in defraying the necessary and ordinary expenses of the state, cities, and counties to reduce or eliminate the annual tax levy on property for state, city and county purposes and to reduce the levy on property for public school education (Laws of 1982, Chapter 230, Section 17).

Yield

No monies will be collected from this tax until fiscal year 1982-83.

Distribution

Each year, a portion of severance tax collections will be distributed in the same manner as the transaction privilege tax (i.e. 25 percent to the cities, 33.6 percent to the counties and 41.4 percent to the state). The portion of collections that is distributed in this manner will increase each fiscal year until 1986-87. The table below shows the amount of severance tax collections that will be distributed in the same manner as transaction privilege taxes during each fiscal year (42-1465, Laws of 1982, Chapter 230, Section 16).

SEVERANCE TAX ON METALLIFEROUS MINERALS (CONT)

period during which collections are received	portion of severance tax collections distributed in the same manner as the transaction privilege tax
January 1, 1983 - June 30, 1983	40%
July 1, 1983 - June 30, 1984	48%
July 1, 1984 - June 30, 1985	60%
July 1, 1985 and thereafter	80%

After making this distribution the balance of severance tax collections will be deposited each year in the state's general fund and is appropriated for public educational purposes (42-1465; Laws of 1982, Chapter 230, Section 16).

Source: State of Arizona Tax Handbook - 1983
Prepared by the Staff of the Joint Legislative Budget Committee

TABLE I

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1986

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
ASARCO, INC.					
Mission Complex (1	9,928,000	9,928,000	123,231,000	None	7,955,000
Ray Unit (2	1,023,000	1,073,000	11,038,000	None	2,171,000
Dump Leach/Cementation			1,363,000		
Heap Leach/SX-EW			2,999,000		
Silver Bell	None	None		None	None
Dump Leach/Cementation			6,814,000		
Total	10,951,000	11,001,000	145,445,000	None	10,126,000

(1 Mission Complex is comprised of the Mission, Eisenhower, San Xavier and Pima Mines.
(2 Asarco acquired Ray Unit from Kennecott November 18, 1986.
Asarco's total share from 1986 Annual Report was 7,700 tons of copper and 1,073,000 tons of ore.
Remaining production figures calculated at these ratios.

(continued)

TABLE I (Cont)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1986

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
CYPRUS MINERALS CO.					
Bagdad	20,602,000	19,752,000	159,883,000	6,133,000	10,989,000
Dump Leach/SX-EW			13,958,000		
Sierrita/Esperanza (1	18,760,000	18,130,000	105,450,000	10,500,000	3,540,000
Dump Leach/Cementation			6,700,000		
Mineral Park (1	None	None	None	None	None
Dump Leach/Cementation			3,201,000		
Total	39,362,000	37,882,000	289,192,000	16,633,000	14,529,000
DUVAL CORPORATION (1					
Esperanza/Sierrita	11,147,000	10,071,000	57,570,000	5,127,000	4,158,000
Dump Leach/Cementation			2,070,000		
Mineral Park	None	None		None	None
Dump Leach/Cementation			1,050,000		
Total	11,147,000	10,071,000	60,690,000	5,127,000	4,158,000

(1 Sierrita/Esperanza and Mineral Park were acquired from Duval Corporation April 1, 1986. Production data is for period of 4/1/86 through 12/31/86. (See Duval)

(1 Duval's mines were sold to Cyprus. Production is for period 1/1/86 through 3/31/86. (See Cyprus)

(continued)

TABLE I (Cont)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1986

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
INSPIRATION CONSOLIDATED					
Inspiration (1	10,487,000	473,000	5,318,000	None	19,085,000
Dump Leach/SX-EW			92,469,000		
Dump Leach/Cementation			6,278,000		
Total	10,487,000	473,000	104,065,000	None	19,085,000
KENNECOTT MINERAL CO.					
Ray Mines Division (1	9,861,000	10,391,000	132,199,000	None	20,920,000
Dump Leach/Cementation			16,334,000		
Heap Leach/SX-EW			35,943,000		
Total	9,861,000	10,391,000	184,476,000	None	20,920,000

(1 Crushers and concentrator shut down in January, 1986.

(1 Kennecott sold Ray Mines Division to Asarco November 18, 1986. Production figures are totals for year less production calculated for Asarco.

(continued)

TABLE I (Cont)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1986

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
MAGMA COPPER CO.					
San Manuel Division					
Sulphide	17,560,000	17,560,000	196,138,000	3,656,000	Block Caving
Oxide	6,722,000	None	None	None	11,401,000
Heap Leach/SX-EW			20,695,000		
In Situ/SX-EW			1,228,000		
Pinto Valley Division	22,042,000	19,580,000	143,141,000	1,866,000	26,671,000
Dump Leach/SX-EW			22,252,000		
Total	46,324,000	37,140,000	383,454,000	5,522,000	38,072,000
NORANDA LAKESHORE MINES, INC.					
Lakeshore	None	None		None	None
In Situ/SX-EW			7,100,000		
Total	None	None	7,100,000	None	None

(continued)

TABLE I (Cont)

COPPER AND MOLYBDENUM PRODUCTION OF LARGE ARIZONA COPPER MINES

1986

COMPANY/MINE	TONS COPPER ORE MINED	TONS COPPER ORE MILLED	POUNDS RECOVERABLE COPPER	POUNDS RECOVERABLE MOLYBDENUM	TONS WASTE/OVERBURDEN REMOVED
PHELPS DODGE CORP.					
Copper Queen Branch	None	None		None	None
Dump Leach/Cementation			3,454,000		
Morenci/Metcalf	39,676,000	39,759,000		523,000	30,062,000
Conc. Smelted			257,938,000		
Conc. Sold			260,450,000		
Dump Leach/Cementation			56,261,000		
Total	39,676,000	39,759,000	578,103,000	523,000	30,062,000
Totals					
Sulphide	161,086,000	146,717,000	1,452,356,000	27,805,000	136,952,000
Oxide Ore	6,722,000				
Dump Leach/Cementation			103,525,000		
Dump Leach/SX-EW			128,679,000		
Heap Leach/SW-EW			59,637,000		
In Situ/SX-EW			8,328,000		
Sub Total SX-EW			196,644,000		
Sub Total Leached			300,169,000		
GRAND TOTALS	167,808,000	146,717,000	1,752,525,000	27,805,000	136,952,000

Source: Personal correspondence with individual companies.

TABLE II

ARIZONA LEACH COPPER PRODUCTION (1

(Thousand Pounds)

MINE OPERATION	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
ANAMAX MINING COMPANY										
Twin Buttes	68,772	71,614	70,343	63,719	67,922	60,796	50,649	50,239	19,824	--
ASARCO INCORPORATED										
San Xavier	12,860	15,183	--	--	--	--	--	--	--	--
Silver Bell	5,012	6,267	6,980	4,423	7,950	8,687	10,374	9,152	8,800	6,814
Ray (2	24,334	25,013	26,502	25,875	25,788	22,420	20,033	20,457	23,706	56,639
CYPRUS MINES CORP.										
Bagdad	15,011	14,097	14,337	12,668	13,244	13,173	13,282	14	14,259	13,958
Johnson	10,327	10,205	10,032	10,302	10,693	9,702	--	8,803	6,200	--
Sierrita/Esperanza (3	8,636	7,469	6,002	9,991	11,566	9,354	6,367	8,500	10,000	8,770
Mineral Park (3	5,260	4,813	3,348	3,690	4,194	3,191	3,101	2,718	3,798	4,251
INSPIRATION CONSOLIDATED COPPER COMPANY										
Inspiration	20,883	35,945	16,638	28,958	50,532	50,000	78,988	79,549	85,136	98,747
Ox Hide	4,639	4,147	1,178	1,015	761	1,572	--	--	--	--
MAGMA COPPER CO.										
Copper Cities	3,346	3,806	4,351	3,984	3,622	2,046	--	--	--	--
Pinto Valley/Miami	11,732	11,703	12,636	11,184	15,736	26,958	24,632	25,602	23,947	22,252
San Manuel (4	--	--	--	--	--	--	--	--	--	21,923
NORANDA LAKESHORE MINES										
Lakeshore	25,031	--	--	--	26,071	45,611	3,244	15,401	13,514	7,100
PHELPS DODGE CORPORATION										
Copper Queen Branch	8,526	7,932	7,316	6,052	4,600	4,545	5,200	3,493	4,144	3,454
Morenci Branch	41,545	51,362	93,983	86,840	96,090	75,735	69,158	60,312	53,228	56,261
New Cornelia Branch	--	--	--	--	--	661	--	920	402	--

(continued)

TABLE II (CONT)

ARIZONA LEACH COPPER PRODUCTION (1

(Thousand Pounds)

MINE OPERATION	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now HECLA MINING CO.)										
Bluebird (5	17,069	3,926	10,955	13,017	13,328	NR	--	--	--	--
Old Reliable	--	--	1,005	1,128	149	--	--	--	--	--
TOTALS	282,983	283,482	285,606	282,846	352,246	334,451	285,028	285,160	266,958	300,169
PERCENT OF PRIMARY COPPER PRODUCED (6 (7	15.3	13.9	13.3	16.4	15.0	19.6	18.8	18.0	15.0	17.1

Source: Arizona Department of Mines and Mineral Resources; This report, Table I-II

(1 Copper recovered from precipitate or by solvent extraction from material dump, heap, vat or in situ leached.
(2 Asarco purchased Ray Unit from Kennecott November 18, 1986.
(3 Cyprus purchased Sierrita/Esperanza and Mineral Park from Duval April 1, 1986.
(4 Open Pit, Heap Leach, SX-EW start-up in spring of 1986. Some In Situ test production.
(5 Part of Inspiration since July, 1984.
(6 Leach copper compared to total copper produced from all primary sources as reported in "Minerals Yearbook - Area Reports: Domestic", U.S. Bureau of Mines through 1978.
(7 Leach Copper compared to total copper produced as reported in Table I for 1979-1986.

TABLE III

RANK OF ARIZONA'S COPPER COMPANIES

BY PRODUCTION OF COPPER AND MOLYBDENUM

1986

Copper			Molybdenum		
Rank	Company	% of AZ Production	Rank	Company	% of AZ Production
1	Phelps Dodge Corp. 578,103,000	33.0	1	Cyprus Minerals Co. 16,633,000	59.8
2	Magma Copper Co. 383,454,000	21.9	2	Magma Copper Co. 5,522,000	19.9
3	Cyprus Minerals Co. 289,192,000	16.5	3	Duval Corp. 5,127,000	18.4
4	Kennecott Mineral Co. 184,476,000	10.5	4	Phelps Dodge 523,000	1.9
5	Asarco, Inc. 145,445,000	8.3			
6	Inspiration Cons. Copper Co. 104,065,000	6.0			
7	Duval Corp. 60,690,000	3.5			
8	Noranda Lakeshore Mines, Inc. 7,100,000	.4			
Total	1,752,525,000	100.00		27,805,000	100.00

TABLE IV

RANK OF ARIZONA'S COPPER MINES

BY PRODUCTION OF COPPER AND MOLYBDENUM

1986

Copper			Molybdenum		
Rank	Mine/Company Copper Produced, lb.	% of AZ Production	Rank	Mine/Company Moly Produced, lb.	% of AZ Production
1	Morenci/Phelps Dodge 574,649,000	32.8	1	Sierrita/Duval & Cyprus 15,627,000	56.2
2	San Manuel/Magma 218,061,000	12.5	2	Bagdad/Cyprus 6,133,000	22.1
3	Ray/Kennecott & Asarco 199,876,000	11.4	3	San Manuel/Magma 3,656,000	13.1
4	Bagdad/Cyprus 173,841,000	9.9	4	Pinto Valley/Magma 1,866,000	6.7
5	Sierrita/Duval & Cyprus 171,790,000	9.8	5	Morenci/Phelps Dodge 523,000	1.9
6	Pinto Valley/Magma 165,393,000	9.4			
7	Mission/Asarco 123,231,000	3.5			
8	Inspiration/Inspiration 104,065,000	6.0			
	Lakeshore/Noranda 7,100,000	.4			
	Silver Bell/Asarco 6,814,000	.4			
	Mineral Park/Duval & Cyprus 4,251,000	.2			
	Copper Queen/Phelps Dodge 3,454,000	.2			
Total	1,752,525,000	100.00		27,805,000	100.00

TABLE V
ARIZONA MINE PRODUCTION
OF RECOVERABLE COPPER IN SHORT TONS

	1982		1983		1984		1985		1986	
	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE	AMOUNT	CHANGE
					BY MONTH					
JANUARY	84,559	(8.7)%	68,560	(19.0)%	68,096	0.4%	72,508	6.5%	81,137	11.9%
FEBRUARY	82,181	(6.7)	54,455	(30.1)	62,432	9.8	67,823	8.6	63,613	(6.2)
MARCH	90,488	(4.1)	66,475	(26.5)	66,058	0.4	76,717	16.1	73,107	(4.7)
APRIL	87,385	(8.0)	61,841	(29.2)	61,076	(0.2)	75,928	24.3	70,572	(7.0)
MAY	73,434	(24.5)	63,699	(13.3)	66,125	4.9	76,690	16.0	71,500	(6.8)
JUNE	67,208	(28.3)	65,449	(2.6)	71,133	9.8	70,816	(0.4)	76,806	8.5
JULY	60,795	(36.1)	54,653	(10.1)	70,235	29.9	72,534	3.3	74,262	2.4
AUGUST	56,753	(44.3)	52,118	(8.2)	70,019	35.8	74,134	5.9	71,732	(3.2)
SEPTEMBER	55,942	(43.2)	64,852	15.9	69,528	8.3	70,732	1.7	72,393	2.3
OCTOBER	61,588	(40.7)	64,049	4.0	73,316	15.8	74,081	1.0	76,419	3.2
NOVEMBER	68,010	(33.9)	69,886	2.8	73,541	6.3	73,129	(0.6)	70,502	(3.6)
DECEMBER	60,307	(28.2)	65,366	8.4	68,901	4.8	78,987	14.6	70,879	(10.3)
					CUMULATIVE YEAR TO DATE					
JANUARY	84,659	(8.7)%	68,560	(19.0)%	68,096	0.4%	72,508	6.5%	81,137	11.9%
FEBRUARY	166,840	(7.7)	126,015	(24.5)	130,528	4.7	140,331	7.5	144,750	3.1
MARCH	257,328	(6.5)	192,490	(25.2)	196,586	3.2	217,048	10.4	217,857	0.4
APRIL	344,713	(6.9)	254,331	(26.2)	257,662	2.4	292,976	13.7	288,429	(1.5)
MAY	418,147	(10.6)	318,030	(23.9)	323,787	2.9	369,666	14.2	359,929	(2.6)
JUNE	485,355	(13.5)	383,479	(21.0)	394,920	4.1	440,482	11.5	436,735	(0.9)
JULY	546,150	(16.8)	438,132	(19.8)	465,155	7.3	513,016	10.3	510,997	(0.4)
AUGUST	602,903	(20.5)	490,250	(18.7)	535,174	10.3	587,150	9.7	582,729	(0.8)
SEPTEMBER	658,845	(23.1)	555,102	(15.7)	604,702	10.1	657,882	8.8	655,122	(0.4)
OCTOBER	720,433	(25.0)	619,151	(14.1)	678,018	10.7	731,963	8.0	731,541	(0.1)
NOVEMBER	788,443	(25.9)	689,037	(12.6)	751,559	10.2	805,092	7.1	802,043	(0.4)
DECEMBER	848,750	(26.0)	754,403	(11.1)	820,460	9.7	884,079	7.7	872,922	(1.3)
AVERAGE MONTH	70,729	(26.0)%	62,867	(11.1)%	68,372	9.7%	73,673	7.7%	72,744	(1.3)

NOTE: Percentage change column shows change from corresponding period in prior year. Parentheses indicate a negative change.

Source: U.S. Department of the Interior, Bureau of Mines.
Prepared By: State of Arizona Joint Legislative Budget Committee.

TABLE VI

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
ANAMAX MINING COMPANY (1											
Twin Buttes	Sulfide	1.11	1.26	0.94	0.82	0.74	0.78	0.67	--	--	--
	Oxide	1.30	1.26	1.27	1.26	1.20	1.06	0.93	0.86	0.84	--
ASARCO INCORPORATED											
Mission (2	Sulfide	0.58	0.59	0.60	0.75	0.75	(0.75)	(0.75)	(0.75)	0.65	0.70
Pima (2	Sulfide	0.48	--	0.46	0.49	0.49	0.48	--	--	--	--
Ray Unit (3 (4	Sulfide	0.92	0.86	0.88	0.91	0.97	0.80	1.19	1.13	0.99	0.99
	Oxide (Silicate)	--	--	--	--	--	--	--	--	1.17	1.23
Sacaton	Sulfide	0.70	0.67	0.68	--	--	--	--	--	--	--
San Xavier (2	Sulfide	--	--	0.80	0.65	0.65	(0.65)	(0.51)	(0.51)	--	--
Silver Bell	Sulfide	0.65	0.65	--	--	--	--	--	--	--	--
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	0.59	0.52	0.50	0.50	0.50	0.50	0.50	0.45	0.44	0.45
	Oxide	--	--	--	--	--	--	--	0.22	0.28	0.21
Esperanza (6	Sulfide	0.29	--	--	0.32	0.29	0.29	--	--	--	--
Johnson	Oxide (3	0.46	0.44	0.40	0.40	0.40	0.40	0.40	0.71	--	--
Mineral Park	Sulfide	0.28	0.26	0.24	0.24	0.32	--	--	--	--	--
Sierrita	Sulfide	0.34	0.33	0.34	0.34	0.30	0.30	(0.30)	0.34	0.33	0.34
INSPIRATION CONSOLIDATED COPPER CO.											
Christmas (OP)	Sulfide	0.74	--	0.74	0.73	0.62	--	--	--	--	--
Inspiration Area	Sulfide	0.70	0.61	0.85	0.58	0.58	0.58	0.53	0.55	0.60	0.54
	Oxide	--	--	--	--	--	--	--	0.50	0.49	0.57
Ox Hide	Oxide (3	0.27	--	--	--	--	--	--	--	--	--

(continued)

TABLE VI (CONT)

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

(Percent Total Copper)

MINE OPERATION		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	0.49	0.52	0.49	0.49	0.46	0.46	--	0.44	0.45	0.45
San Manuel	Sulfide	(0.70)	0.64	0.63	0.65	0.64	0.66	0.64	0.64	0.61	0.62
	Oxide	--	--	--	--	--	--	--	--	--	0.58
Superior	Sulfide	(4.50)	4.36	4.41	4.32	4.48	4.32	--	--	--	--
NORANDA LAKESHORE MINES INC.											
Lakeshore (7	Sulfide	0.91	--	--	--	--	--	--	--	--	--
	Oxide (3	0.93	--	--	--	1.00	1.00	(1.00)	(1.00)	--	--
PHELPS DODGE CORPORATION											
Metcalf	Sulfide	0.70	0.79	0.78	0.69	--	0.78	--	--	--	--
Morenci (8	Sulfide	0.81	0.80	0.71	0.82	0.74	0.72	0.73	0.81	0.86	0.84
New Cornelia	Sulfide	0.64	0.59	0.53	0.51	0.50	0.64	0.60	0.55	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now Hecla Mining Co.)											
Bluebird (9	Oxide	0.79	0.70	0.40	0.40	0.40	--	--	--	--	--
WEIGHTED AVERAGE SULFIDE GRADE (10		0.57	0.61	0.64	0.58	0.58	0.59	0.65	0.70	0.62	0.61

(continued)

TABLE VI (CONT)

AVERAGE COPPER CONTENT OF ORE PRODUCED AT ARIZONA COPPER MINES

Source: Company annual reports, Form 10-K's and Prospectus; Personal correspondence and Arizona Department of Mines and Mineral Resources

( ) Percentage in parenthesis is approximate: not used in calculation of weighted average.

(1 Included ANAMAX share of Palo Verde deposit for 1979-1982.

(2 Combined as Mission Complex in 1985.

(3 Ray Unit acquired from Kennecott November 18, 1986.

(4 Grade reported for Kennecott's Ray mine is an average of oxide and sulfide together for 1977 to 1982.

(5 Acid soluble copper.

(6 Sierrita, Esperanza and Mineral Park acquired from Duval Corp. April 1, 1986.

(7 The Lakeshore mine was owned and operated by the Hecla Mining Company in 1976 and 1977.

(8 Combined Metcalf and Morenci mines production in 1983 et seq.

(9 Bluebird property acquired by Inspiration in 1984.

(10 Weighted average grade of ore milled, based generally on an assay of total copper.

TABLE VII

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES (1

(Percent of Total Copper)

MINE OPERATION		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
ANAMAX MINING COMPANY											
Twin Buttes (2	Sulfide	87	76	85	87	85	--	--	--	--	--
	Oxide	76	79	78	76	77	Total 87 (80 est.)		80	(80 est.)	--
ASARCO INCORPORATED											
Mission (3	Sulfide	87	87	75	87	94	85	80	(80 est.)	92	91
Pima (3	Sulfide	79	--	76	84	76	89	--	--	--	--
Ray (4	Sulfide	--	--	--	--	70	70	(70 est.)	83	81	82
Sacaton	Sulfide	82	83	78	--	--	--	--	--	--	--
San Xavier (3	Sulfide	--	--	82	66	76	78	79	(80 est.)	--	--
Silver Bell	Sulfide	78	78	--	--	--	--	--	--	--	--
CYPRUS MINES CORPORATION											
Bagdad	Sulfide	73	83	82	76	94	83	83	92	91	93
	Oxide	--	--	--	--	--	--	--	52	51	54
Johnson	Oxide (6	90	96	79	86	86	--	62	(62 est.)	--	--
Esperanza (5	Sulfide	85	--	--	90	87	--	--	--	--	--
Mineral Park (5	Sulfide	75	76	73	84	75	--	--	--	--	--
Sierrita (5	Sulfide	88	91	87	86	80	98 (?)	(88 est.)	89	92	91
INSPIRATION CONSOLIDATED COPPER CO.											
Christmas (OP)	Sulfide	74	--	--	70	71	--	--	--	--	--
Inspiration Area (7	Sulfide	54	55	53	81	74	68	86	80	76	66
Ox Hide	Oxide (6	56	--	--	--	--	--	--	--	--	--

(continued)

TABLE VII (CONT)

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES (1

(Percent of Total Copper)

MINE OPERATION		1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
MAGMA COPPER COMPANY											
Pinto Valley	Sulfide	92	89	84	83	94	95	--	88	80	84
San Manuel	Sulfide	--	85	83	95	87	89	86	90	90	90
Superior	Sulfide	--	90	91	95	93	(93 est.)	--	--	--	--
NORANDA LAKESHORE MINES INC.											
Lakeshore	Sulfide	99	--	--	--	--	--	--	--	--	--
	Oxide (6	100	--	--	--	92	--	--	--	--	--
PHELPS DODGE CORP.											
Metcalf	Sulfide	56	61	59	58	--	--	--	--	--	--
Morenci (8	Sulfide	72	77	68	64	69	68	71	70	86	76
New Cornelia	Sulfide	82	84	80	79	78	85	78	76	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORPORATION (Now Hecla Mining Co.)											
Bluebird (9 (10	Oxide	38	85	36	41	156	--	--	--	--	--

(continued)

TABLE VII (CONT)

PERCENT CONTAINED COPPER RECOVERED AT ARIZONA COPPER MINES

Source: Company Annual Reports and Form 10-K's, E&MJ International Directory; Arizona Department of Mines and Mineral Resources.

(1 Recoveries are based on available reported production and average grade of material treated. A number of operations are not listed because of inadequate data.

(2 Recovery includes ANAMAX's share of Palo Verde 1979-1981-1982-1983-1984.

(3 Combined as Mission Complex in 1985.

(4 Ray Unit acquired from Kennecott, November 18, 1986.

(5 Sierrita, Esperanza and Mineral Park acquired from Duval Corp, April 1, 1987.

(6 Percent recovery of acid soluble copper.

(7 Percent recovery in flotation-concentration treatment, after ore has been leached for 1971-1979.

(8 Includes Metcalf production, 1983-1985.

(9 Bluebird property acquired by Inspiration in 1984.

(10 Recovery by leaching heaps continued after mining was terminated in July 1981.

TABLE VIII

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES (1

(Waste:Ore)

MINE OPERATION	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
ANAMAX MINING COMPANY										
Twin Buttes	5.60:1	2.00:1	2.90:1	3.32:1	3.62:1	2.05:1	1.14:1	--	--	--
ASARCO INCORPORATED										
Eisenhower (2 (3	--	--	--	--	0.71:1	0.67:1	0.57:1	1.26:1	--	--
Mission (3	2.30:1	2.30:1	0.76:1	3.05:1	2.01:1	1.62:1	2.52:1	1.32:1	0.74:1	0.84:1
Pima (3	1.60:1	--	5.20:1	6.28:1	3.06:1	1.42:1	--	--	--	--
Ray (4	2.50:1	3.10:1	2.70:1	3.15:1	1.88:1	2.30:1	2.72:1	2.11:1	2.27:1	2.12:1
Sacaton	4.40:1	2.70:1	3.10:1	2.02:1	1.30:1	0.70:1	0.35:1	0.10:1	--	--
San Xavier (3	5.00:1	1.10:1	1.10:1	6.01:1	6.18:1	2.90:1	0.96:1	1.97:1	--	--
Silver Bell	1.80:1	1.40:1	1.50:1	--	1.41:1	--	1.09:1	1.17:1	--	--
CYPRUS MINERALS COMPANY										
Bagdad	7.80:1	1.70:1	1.80:1	1.52:1	1.78:1	1.45:1	1.53:1	0.94:1	0.42:1	0.54:1
Esperanza (5	1.10:1	--	1.30:1	0.76:1	1.95:1	--	--	--	--	--
Johnson	1.60:1	2.50:1	1.30:1	2.01:1	1.52:1	--	0.03:1	--	--	--
Mineral Park (5	1.60:1	1.50:1	1.70:1	1.71:1	1.44:1	--	--	--	--	--
Sierrita (5	1.60:1	1.30:1	1.10:1	1.11:1	0.98:1	0.55:1	0.33:1	0.76:1	0.55:1	0.19:1
INSPIRATION CONSOLIDATED COPPER COMPANY										
Christmas	4.40:1	--	--	4.40:1	3.24:1	--	--	--	--	--
Inspiration Area	2.40:1	2.80:1	3.40:1	2.40:1	1.53:1	1.42:1	0.27:1	1.72:1	1.50:1	1.82:1
Ox Hide	0.20:1	--	--	--	--	--	--	--	--	--
MAGMA COPPER COMPANY										
San Manuel Oxide	--	--	--	--	--	--	--	--	--	1.70:1
Pinto Valley	1.70:1	1.60:1	1.80:1	1.07:1	1.77:1	1.80:1	--	0.79:1	1.01:1	1.21:1

(continued)

TABLE VIII (CONT)

STRIPPING RATIOS AT ARIZONA OPEN-PIT COPPER MINES (1

(Waste:Ore)

MINE OPERATION	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
PHELPS DODGE CORPORATION										
Metcalf	1.80:1	1.50:1	2.30:1	1.67:1	--	--	--	--	--	--
Morenci (6	1.50:1	1.50:1	1.40:1	1.30:1	1.63:1	0.79:1	0.64:1	0.90:1	0.68:1	0.76:1
New Cornelia	1.10:1	1.40:1	1.00:1	2.27:1	0.48:1	1.21:1	0.30:1	0.58:1	--	--
RANCHERS EXPLORATION & DEVELOPMENT CORP. (Now Hecla Mining Co.)										
Bluebird (7 (8	3.30:1	1.50:1	1.50:1	1.50:1	0.003:1	--	--	--	--	--
WEIGHTED AVERAGE*	2.21:1	1.75:1	1.75:1	1.90:1	1.57:1	1.31:1	0.57:1	1.10:1	0.88:1	0.96:1

Source: "Minerals Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Company Annual Reports; E&MJ International Directory of Mining and Mineral Processing Operations; Arizona Department of Mines & Mineral Resources; Company submitted data for 1985.

(1 Leachable rock included with waste (except at solely leach operations).
(2 Mining was done by ASARCO, includes ANAMAX's share of ore.
(3 Combined as Mission Complex 1985.
(4 Ray Unit acquired from Kennecott November 18, 1986.
(5 Sierrita, Esperanza and Mineral Park acquired from Duval April 1, 1986.
(6 Combined Morenci and Metcalf 1984-1985.
(7 Stripping of overburden ceased in January 1981, but mining continued until July.
(8 Bluebird Property acquired by Inspiration in 1984.

***NOTE:** These are now weighted averages so use caution in making comparisons to the averages presented in previous editions of this report.

TABLE IX

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER

RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1970	150,240,842	107,292	7,130,261	15,672	1,694,294,000	11.28	
		3,904,400	12,626,700	26,700	977,608,000	57.700	1,020,839,100
1971	149,293,547	93,617	6,106,204	22,684	1,529,780,500	10.25	
		3,820,510	9,437,479	39,872	786,812,004	51.433	839,942,263
1972	165,914,825	102,526	6,614,957	27,126	1,695,858,000	10.22	
		5,987,518	11,143,226	46,791	858,392,446	50.617	922,314,190
1973	181,311,945	102,376	7,164,988	37,657	1,735,012,000	9.57	
		10,013,397	18,325,173	59,372	1,021,314,814	58.865	1,109,025,384
1974	178,913,296	90,206	6,308,721	28,346	1,609,808,000	9.00	
		14,488,424	29,701,332	57,067	1,233,901,735	76.649	1,335,158,491
1975	168,750,152	82,759	6,190,805	25,030	1,502,978,000	8.91	
		13,364,751	27,354,196	61,411	954,917,072	63.535	1,057,047,019
1976	194,136,559	97,961	7,308,395	31,073	1,912,430,000	9.85	
		12,276,473	31,816,805	89,148	1,316,210,823	68.824	1,449,452,101
1977	168,641,401	87,874	6,696,415	34,574	1,705,240,000	10.11	
		13,032,593	30,957,660	120,497	1,122,184,339	65.808	1,166,295,089
1978	178,204,491	92,508	6,611,781	33,029	1,817,670,000	10.20	
		17,905,108	35,709,502	150,142	1,190,755,617	65.510	1,244,520,369
1979	203,977,408	99,549	7,454,306	35,101	1,914,501,095	9.39	
		30,622,766	82,699,941	213,065	1,767,735,441	92.334	2,094,081,895

(continued)

TABLE IX (CONT)

ARIZONA PRODUCTION AND VALUE OF COPPER, MOLYBDENUM, GOLD AND SILVER

RECOVERED FROM COPPER ORE

Year	Copper Ore Tons	Gold Troy Ounces Value (3	Silver Troy Ounces Value (4	Molybdenum (1 1,000 lbs. Value (in $1,000)	Copper (2 Pounds Value	Copper (2 Lbs. Cu/ton ore Ave. /lb. (5	Value of Copper Gold, Silver & Molybdenum
1980	169,650,401	71,533	5,640,703	36,299	1,521,850,812	8.97	
		43,814,606	116,376,559	324,150	1,543,400,219	101.416	2,027,741,384
1981	216,787,430	95,496	7,565,368	35,600	2,143,898,000	9.89	
		43,891,299	79,575,340	273,052	1,795,385,941	83.744	2,191,904,580
1982	146,124,870	61,050	6,301,000	22,099	1,697,500,000	11.62	
		22,949,000	50,090,000	100,673	1,261,415,000	74.31	1,435,127,000
1983	152,902,150	61,991	4,492,000	23,934	1,495,208,000	9.78	
		26,284,000	51,383,000	79,459	1,144,285,000	76.53	1,301,411,000
1984	145,278,431	51,548	4,093,000	23,184	1,582,549,000	10.89	
		18,591,200	33,320,000	78,827	1,044,483,000	66.00	1,175,151,000
1985	159,547,970	52,053	4,885,000	30,428	1,778,334,456	11.14	
		16,585,000	30,007,000	98,827	1,166,571,000	65.60	1,311,990,000
1986	153,439,000	63,334 (P	4,812,000 (P	27,805	1,752,525,000	11.42	
		23,370,000	25,983,000	79,878	1,157,543,000	66.05	1,286,774,000

Source: "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines.

(1 Molybdenum content of recovered concentrate.
(2 Excludes precipitate copper from dump and in-place leaching prior to 1982.
(3 At average annual domestic, free market gold price.
(4 At E&MJ average annual N.Y. market price for .999 fine silver.
(5 At E&MJ average annual price, U.S. Producer Cathode Preliminary.
(P Preliminary.

TABLE X

NONFUEL MINERAL PRODUCTION IN ARIZONA (1

Mineral	1985 Quantity	1985 Value (thousands)	1986 (P Quantity	1986 (P Value (thousands)
Clays ----------thousand short tons--	186	$1,503	249	$1,499
Copper (recoverable content of ores, etc.) ----metric tons--	796,556	1,175,995	797,356	1,165,729
Gem stones ----------	NA	2,700	NA	W
Gold (recoverable content of ores, etc.) ------troy ounces--	52,053	16,535	63,334	23,370
Gypsum ----------thousand short tons--	251	1,926	279	2,168
Lead (recoverable content of ores, etc.) ------metric tons--	581	244	W	W
Lime ----------thousand short tons--	476	21,226	435	19,403
Molybdenum (content of ores, etc.) --------thousand pounds--	24,125	63,389	W	W
Pumice ----------thousand short tons--	W	2	W	2
Salt ----------do-------	--	--	45	68
Sand and gravel (construction) ----------do-------	37,000 (e	118,000 (e	30,700	113,000
Silver (recoverable content of ores, etc.) thousand troy ounces--	4,885	30,007	4,812	25,983
Stone (crushed) ----------thousand short tons--	5,929	23,111	5,600	25,100
Combined value of cement, diatomite (1986), perlite, pyrites (1985), sands and gravel (industrial), stone (dimension), and values indicated by symbol W ----------	XX	95,447	XX	189,970
Total ----------	XX	1,550,085	XX	1,566,292

Source: "The Mineral Industry of Arizona in 1986" Mineral Industry Surveys, U.S. Bureau of Mines.

(e Estimated.
(P Preliminary.
NA Not applicable.
W Withheld to avoid disclosing company proprietary data; value included in "Combined value" figure.
XX Not applicable.
(1 Production as measured by mine shipments, sales, or marketable production (including consumption by producers).

TABLE XI

COPPER MINE CAPACITY IN ARIZONA (1
(Short tons of Recoverable Copper/Year)

OPERATOR	MINE	CAPACITY
Phelps Dodge	Morenci/Metcalf	270,000
Magma	San Manuel	130,000
Asarco	Ray	122,000
Cyprus	Sierrita/Esperanza	120,000
Magma	Pinto Valley	85,000
Cyprus	Bagdad	85,000
Inspiration	Inspiration Area	77,000
ASARCO	Mission Complex	62,000
Phelps Dodge	New Cornelia	40,000
Cyprus	Mineral Park	17,000
Cyprus	Lakeshore	16,000
Inspiration	Christmas	8,000
Magma	Miami	6,000
Magma	Copper Cities	2,000
Phelps Dodge	Copper Queen/Lavender	2,000
TOTAL		1,042,000

Source: Arizona Department of Mines & Mineral Resources file data; Company Annual Reports and Form 10-K; Professional Publications.

1) Figures generally represent a current estimate of the productive capacity of primary recoverable copper in concentrates, precipitates, and cathodes. Figures do not represent smelter or refinery capacity. The estimates are based on recent production figures and on capacities of concentrator and leach plant facilities. Other factors affecting actual production include, for example, grade of ore and recovery. Some capacities have been published by the reporting company.

TABLE XII

MINE PRODUCTION OF COPPER IN THE UNITED STATES

Short Tons

	1982	1983	1984	1985	1986
ARIZONA	848,251	747,604	824,486	882,424	874,716
IDAHO	3,389	3,920	4,113	3,996	(b)
MISSOURI	8,753	8,515	(b)	(b)	(b)
MONTANA	71,596	36,748	19,502	16,674	(b)
UTAH	208,436	187,118	(b)	(b)	(b)
OTHER STATES (a)	123,897	160,401	350,085	300,775	394,505
TOTAL	1,264,322	1,144,306	1,198,186	1,203,869	1,269,221

Source: American Bureau of Metal Statistics, Inc. Non-Ferrous Metal Data 1986, p. 25
Derived from U.S. Bureau of Mines data.

(a) Includes California, Colorado, Illinois, Michigan, Nevada, New Mexico and Tennessee.
(b) Included in "Other States".

TABLE XIII
COPPER SMELTERS
North America
End of 1986-Short Tons

Company	Location Of Plant	Annual Capacity
	United States	
ASARCO Incorporated		
Hayden Smelter	Hayden, AZ	940,000
Hayden-Ray Smelter	Hayden, AZ	360,000
El Paso Smelter	El Paso, TX	576,000
Tacoma Smelter	Tacoma, WA	(c)
Chemetco Inc.	Alton, IL	150,000
Copper Range Company	White Pine, MI	70,000
Inspiration Consolidated Copper Company	Claypool, AZ	450,000
Kennecott		
Nevada Mines Division	Mcgill, NV	255,000
Utah Copper Division	Garfield, UT	820,000
Magma Copper Company		
San Manuel Division	San Manuel, AZ	800,000
Phelps Dodge Corporation		
Douglas Smelter	Douglas, AZ	500,000
Morenci Branch	Morenci, AZ	650,000
New Cornelia Branch	Ajo, AZ	190,000
Tyrone Branch	Playas, NM	750,000
Tennessee Chemical Company	Copperhill, TN	18,000
United States Metals Refining Co., A Division of AMAX Copper, Inc.	Carteret, NJ	250,000
Total (a)		**6,779,000**
	Canada	
Falconbridge Ltd.	Falconbridge, Ont.	700,000
Gaspe Mines	Murdochville, Que.	357,000
Hudson Bay Mining and Smelting Co., Ltd.	Flin Flon, Manitoba	350,000
Inco Ltd.	Copper Cliff, Ont.	2,400,000
Noranda Mines, Ltd.	Noranda, Que.	1,000,000
Total (a)		**4,807,000**
	Mexico	
Cia. Minera De Santa Rosalia, S.A.	Santa Rosalia, Baja, CA	100,000
Compania Minera De Cananea, S.A.	Cananea, Son.	277,000
Industrial Minera Mexico, S.A.	San Luis Potosi	300,000
Mexicana De Cobre, S.A. De C.V.	Nacozari, Sonora	225,000
Total (a)		**932,000**

Source: American Bureau of Metal Statistics Inc.
The capacity of copper smelting is given as estimated by the respective proprietors.
(a) Tons of material.
(b) Tons of product.
(c) Smelting operations ceased early 1985.

TABLE XIV

COPPER PRODUCTION BY COMPANIES (g

Short Tons

	1982	1983	1984	1985	1986
	United States				
Anaconda Copper Company (own mines) (d	164,291	43,243	14,933	--	--
Anamax Mining Company	145,290	49,108	25,709	9,864	--
ASARCO Incorporated	119,615	110,746	103,710	85,470	95,330
Cominco American Incorporated And Dresser Minerals (e	2,033	869	1,045	1,192	1,892
Copper Range Company (f	22,600	26,575	24,761	--	31,298
Cyprus Bagdad Copper Company	86,623	81,033	23,876	83,671	86,920
Cyprus Johnson Copper Company	4,851	4,859	4,401	3,100	2,436
Cyprus Pima Mining Company	20,201	--	--	--	--
Duval Corporation	58,027	71,510	92,204	110,690	112,180
Hecla Mining Company (a	1,159	1,283	742	749	346
Coeur Mine (j	60	56	61	61	62
Consolidated Silver (m	2	--	--	--	--
Galena Mine (k	330	307	172	154	141
Lucky Friday Mine	666	756	442	534	143
Sunshine Mine	101	164	67	--	--
Victoria Mine	--	--	--	--	--
Inspiration Consolidated Copper Company (f	54,699	40,778	44,112	40,402	32,085
Kennecott (U.S. mines) (l	285,716	318,000	303,000	235,000	190,000
Magma Copper Company (f	132,374	99,705	120,345	108,642	112,513
Superior Division	25,633	--	--	--	--
San Manuel Division	106,741	99,705	120,345	108,642	112,513
Noranda Lakeshore Mines, Inc. (b	22,800	18,760	7,701	6,779	3,581
Phelps Dodge Corporation (U.S. mines) (b	150,100	263,100	331,232	410,076	405,400
Pinto Valley Copper Corporation	56,848	10,264	56,507	90,839	97,544
Ranchers-Exploration And Development Corp. (n	3,998	--	--	--	--
Tennessee Chemical Company	11,685	11,725	9,245	8,450	7,475
Refiners (c	465,987	401,567	451,603	442,705	439,612
AMAX Copper, Inc.	147,509	126,799	105,226	28,508	--
ASARCO Incorporated	318,478	274,768	346,377	414,197	439,612

(a Includes Hecla's share of production from each mining property.
(b Includes copper produced from purchased ores.
(c The totals for these concerns are to a large extent duplications of the reports of other producers.
(d Includes Anaconda's 50% share of Anamax Mining Company.

(continued)

TABLE XIV (CONT)

(e Magmont mine.
(f Refined production.
(g Copper content of mine production unless otherwise noted.
(h Mine abandoned in 1979.
(i Mine abandoned in 1981.
(j Operated by ASARCO - Shows Hecla Mines share of 5%.
(k Operated by ASARCO - Shows Hecla Mines share of 25%.
(l Reported production of refined copper plus unrefined copper sales. Includes only Kennecott's share from jointly owned properties.
(m Operated by Hecla Mining Company - Shows Hecla's 64% share.
(n Ranchers was merged into Hecla Mining Company in 1984. Production at the Bluebird was discontinued in 1982 and the property has been sold.

TABLE XV

Copper Imports Of The United States By Countries

Copper Content-Short Tons

	1982	1983	1984	1985	1986
Ore, Matte & Regulus	**108,133**	**102,807**	**17,075**	**7,710**	**5,977**
Canada	22,850	41,304	4,084	2,820	2,147
Mexico	57,814	34,350	249	19	--
Honduras	--	2,260	254	83	--
Argentina	--	--	--	--	18
Bolivia	14	26	--	--	--
Chile	5,423	7,596	2,597	77	71
Peru	1,093	4,407	1,175	1,265	1,431
Venezuela	--	--	--	664	--
Netherlands	--	433	166	--	--
India	--	--	3	--	--
Japan	--	11	218	524	639
Philippines	17,605	9,270	6,313	--	--
Taiwan	--	--	18	--	--
Botswana	--	1	--	--	--
South Africa	59	363	--	108	--
Zimbabwe	6	--	--	--	--
Australia	3,269	2,786	1,998	2,150	1,671
Blister Copper	**114,021**	**87,588**	**66,340**	**28,635**	**51,049**
Canada	29,542	4,547	5	2,559	3,248
Mexico	4,772	10,206	7,610	2,117	20,068
Argentina	--	1,808	--	--	--
Chile	67,172	66,255	51,555	19,823	27,409
Peru	11,213	3,803	6,902	3,819	--
Belgium	1,147	--	--	--	--
Germany, F.R.	116	19	76	72	269
United Kingdom	11	--	--	--	--
Egypt	--	854	--	--	--
Zambia	--	--	--	--	55
Other Countries	48	96	192	245	--
Refined Cathodes & Shapes	**313,909**	**532,399**	**555,968**	**415,675**	**541,990**
Canada	72,046	100,669	202,957	141,085	219,969
Mexico	3,111	--	--	1,780	1,419
Chile	182,003	297,368	169,826	167,548	164,436
Peru	14,920	34,458	58,509	38,714	59,035
Belgium	1,166	6,363	13,359	5,865	2,386
Finland	--	78	139	119	--
France	--	20	63	43	--
Germany, F.R.	7	1,097	441	1,209	--
Italy	--	21	20	--	--
Netherlands	--	40	80	--	--
Norway	2,265	279	1,959	886	--
Sweden	20	--	--	--	--

(continued)

TABLE XV (CONT)

	1982	1983	1984	1985	1986
United Kingdom	358	346	41	3,541	6,381
Japan	15	10,120	4,163	5,241	--
South Korea	2,205	3,307	910	2,393	--
Philippines	--	--	1,050	--	--
Congo (Brazzaville)	--	--	--	--	3,155
Ghana	--	3,816	--	--	--
South Africa	--	15,114	555	6,453	11,101
Zaire	24,535	32,082	30,907	30,057	39,688
Zambia	10,368	27,221	64,501	9,821	32,714
Australia	--	--	3,270	8	--
U.S.S.R.	728	--	--	--	--
Hungary	60	--	--	--	--
Other Countries	102	--	3,218	912	1,706
Waste & Scrap (unalloyed)	18,056	25,450	25,362	25,368	29,984
Waste & Scrap (alloyed)	20,760	34,597	34,267	25,591	31,635
Copper in Rolls, Sheets or Rods	24,056	26,620	43,007	41,870	41,473
Canada	5,324	6,027	12,014	14,202	10,386
Mexico	97	188	11	134	--
Brazil	2,199	2,829	3,792	2,333	2,454
Chile	479	1,220	1,949	1,486	7,277
Peru	310	299	662	909	619
Belgium	467	226	169	1,068	880
Finland	1,487	1,147	2,715	2,208	2,180
France	2,213	2,264	1,916	1,808	704
Germany, F.R.	2,930	4,182	10,020	7,451	6,468
Italy	24	347	1,401	975	907
Netherlands	32	57	50	129	210
Sweden	1,583	1,389	2,408	3,151	2,843
United Kingdom	105	91	166	135	312
Yugoslavia	305	883	433	696	479
Japan	4,147	3,392	4,604	3,559	3,664
South Korea	--	--	--	--	538
South Africa	--	265	143	412	528
Australia	2,059	1,038	264	154	535
Other Countries	289	770	225	1,022	489
Copper Seamless Tube & Tubing	17,762	27,499	32,694	32,398	42,485
Canada	2,107	3,778	5,767	5,502	6,490
Mexico	948	5,449	3,281	955	6,496
Brazil	--	--	707	224	--
Chile	155	140	151	297	400
Finland	--	--	714	970	236
France	--	--	183	219	446
Germany, F.R.	427	327	729	837	702
Italy	--	--	--	--	289
United Kingdom	47	27	164	126	295
Japan	13,525	16,840	20,394	22,833	26,514
Other Countries	551	933	598	428	617

(continued)

TABLE XV (CONT)

	1982	1983	1984	1985	1986
Brass Rods, Sheets, Plates, Bars & Strip	**49,226**	**58,297**	**93,024**	**68,028**	**63,946**
Canada	3,723	3,580	5,572	3,482	2,292
Mexico	565	1,795	1,234	190	1,503
Argentina	790	198	329	695	2,163
Brazil	3,103	5,813	15,101	8,929	7,098
Belgium	243	289	404	409	--
France	4,936	5,470	12,363	6,081	5,400
Germany, F.R.	16,095	19,764	26,906	18,575	16,390
Italy	469	1,384	3,182	3,591	2,592
Netherlands	4,202	4,247	6,728	5,449	5,048
Sweden	324	290	607	1,808	774
Switzerland	996	1,343	1,432	1,789	2,428
United Kingdom	1,778	810	1,403	686	456
Yugoslavia	717	939	2,306	1,557	1,590
Israel	1,231	1,259	1,322	1,141	1,095
Japan	6,561	8,159	7,059	7,481	8,771
South Korea	--	--	--	--	3,618
South Africa	453	819	1,188	648	630
Hungary	610	858	796	539	684
Other Countries	2,325	1,205	5,026	4,920	1,414
Copper & Alloyed Foil (a	**25,533**	**28,008**	**39,717**	**33,951**	**31,129**
Canada	4,966	5,205	7,900	5,763	5,219
Belgium	113	93	46	--	--
France	522	308	544	36	--
Germany, F.R.	766	769	2,061	1,033	1,057
Netherlands	7,442	7,976	9,047	8,968	8,978
Sweden	9,448	10,529	13,785	13,732	13,248
United Kingdom	653	1,109	2,488	631	518
Japan	1,359	1,661	2,533	2,303	1,518
Other Countries	264	358	1,313	1,485	591
Brass Seamless Tube & Tubing	**13,996**	**17,259**	**22,798**	**20,212**	**21,171**
Canada	1,018	3,447	4,303	2,443	1,025
Mexico	423	143	672	185	918
Brazil	462	174	500	359	575
France	173	335	77	39	--
Germany, F.R.	6,489	7,919	10,457	9,340	9,438
Greece	72	59	225	116	127
Italy	165	252	504	1,282	1,537
Netherlands	1	--	392	250	--
Portugal	--	--	--	--	164
Spain	137	2	9	2	--
Switzerland	17	12	19	44	--
United Kingdom	295	132	326	211	--
Yugoslavia	152	307	674	592	535
Israel	203	156	270	311	332
Japan	2,966	3,897	3,619	3,665	4,049
South Korea	281	175	459	444	719
South Africa	683	44	4	699	1,289
Other Countries	459	205	288	230	463

(continued)

TABLE XV (CONT)

	1982	1983	1984	1985	1986
Copper Alloyed Wire	4,569	4,334	5,362	4,757	8,026
Copper Wire Insulated (b	30,001	44,977	68,190	83,016	95,201
Canada	11,949	22,704	36,057	36,393	33,491
Mexico	2,376	2,129	5,592	6,683	10,528
Costa Rica	--	--	--	--	2,757
Brazil	--	2,317	3,893	5,904	4,141
Chile	836	669	132	918	1,444
Peru	2,320	1,156	356	5,251	4,499
Venezuela	--	--	--	--	3,427
France	462	1,129	1,699	2,598	2,538
Germany, F.R.	658	614	1,127	921	--
Italy	722	1,016	2,169	3,111	3,011
Spain	25	258	1,025	3,227	4,205
Sweden	6	62	49	85	--
United Kingdom	1,498	1,085	789	718	--
Yugoslavia	4,299	2,846	1,837	2,595	2,898
Israel	307	472	732	810	--
Japan	1,834	4,952	3,396	3,149	6,862
South Korea	580	794	488	3,274	5,797
Taiwan	--	--	--	--	5,563
Other Countries	2,129	2,774	8,849	7,379	4,040

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census
Current monthly data available, report 010, for the above table on an annual subscription basis.
(a) Metal weight. (b) Gross weight.

COPPER EXPORTS OF THE UNITED STATES BY COUNTRIES

Copper Content-Short Tons

	1982	1983	1984	1985	1986
Ore, Concentrate & Matte	215,256	47,110	67,240	128,206	192,183
Canada	708	92	87	3,050	6,993
Belgium	--	--	212	100	--
Finland	--	--	--	--	5,096
Germany, F.R.	18,420	7,696	1,694	--	--
Netherlands	--	--	11	--	--
India	--	124	33	--	--
Israel	--	--	2	--	--
Japan	163,418	32,330	62,004	113,352	145,103
South Korea	1,718	--	3,195	7,628	15,548
Taiwan	--	6,868	--	4,076	5,505
China	--	--	--	--	13,771
Other Countries	30,992	--	--	--	167

(continued)

TABLE XV (CONT)

	1982	1983	1984	1985	1986
Blister Copper	**2,213**	**8,213**	**9,237**	**19,817**	**17,598**
Canada	484	397	430	408	437
Mexico	1,557	15	47	2,804	--
Chile	--	28	4	--	--
Austria	--	--	556	--	--
Belgium	--	26	784	--	--
Germany, F.R.	1	141	257	100	--
Netherlands	--	--	276	--	--
Portugal	--	--	--	--	125
Spain	--	--	--	--	100
Hong Kong	--	68	213	6	185
Japan	6	8	18	--	776
South Korea	57	7,194	6,480	16,177	14,879
Singapore	--	15	72	76	94
Taiwan	--	68	84	93	636
Australia	--	--	--	--	139
Other Countries	108	321	100	246	227
Refined Ingots, Bars, Etc.	**38,554**	**96,482**	**103,532**	**53,037**	**16,446**
Canada	3,921	2,739	4,513	6,165	5,357
Mexico	1,223	9,613	3,288	12,729	317
Brazil	416	3	123	53	126
Venezuela	276	19	13	27	149
Belgium	1,278	812	51	671	--
France	1,222	708	955	318	516
Germany, F.R.	2,088	2,423	1,401	1,439	1,533
Netherlands	6,414	66,941	7,387	19,343	305
Spain	200	69	126	2	--
Sweden	71	134	9	76	--
Switzerland	47	65	46	40	108
United Kingdom	1,476	486	1,080	806	2,469
Hong Kong	--	32	168	1,050	661
India	--	86	32	24	--
Israel	132	13	14	30	--
Japan	1,116	8,031	78,568	5,605	--
South Korea	399	6	1,737	1,146	1,473
Singapore	--	3	64	--	--
Taiwan	125	1,130	3,539	1,609	2,835
Ghana	--	--	--	--	246
Australia	8	14	7	4	--
China	17,713	2,375	55	25	--
Other Countries	429	780	356	1,875	351
Copper Waste & Scrap (unalloyed)	**59,987**	**52,897**	**89,075**	**148,040**	**150,375**
Canada	11,096	14,742	12,399	18,277	15,149
Mexico	3,109	9,373	14,915	13,507	6,488
Brazil	556	--	--	1,875	4,374
Belgium	3,052	2,677	2,209	10,383	3,552
France	61	19	57	182	--
Germany, F.R.	1,537	757	3,270	18,654	9,385
Italy	--	--	839	7,553	13,585
Netherlands	622	172	1,085	4,395	1,887
Spain	4,351	399	2,058	5,292	6,191

(continued)

TABLE 69 (CONT'D)

	1982	1983	1984	1985	1986
Sweden	807	61	487	256	--
United Kingdom	2,115	486	573	4,303	1,837
Hong Kong	--	79	446	1,580	4,315
India	6,179	2,563	1,288	1,102	760
Japan	7,409	3,822	16,879	14,829	13,855
South Korea	17,117	16,348	14,520	15,294	13,432
Singapore	--	--	--	1,062	754
Taiwan	1,475	1,341	17,939	27,459	31,899
Thailand	--	9	0	0	--
Australia	--	--	79	58	--
Other Countries	501	69	419	2,864	1,108
Copper-Base Alloy, Waste & Scrap (a)	100,946	88,672	119,499	100,791	107,101
Canada	12,598	19,117	33,438	28,421	22,429
Mexico	1,453	4,016	2,665	4,219	835
Brazil	580	--	--	401	4,363
Venezuela	--	1	262	374	--
Belgium	4,863	5,229	3,455	4,360	4,187
France	871	239	224	227	--
Germany, F.R.	8,044	2,303	3,396	10,814	5,325
Italy	57	3	2,695	9,804	21,458
Netherlands	1,766	2,154	664	4,315	1,664
Spain	4,360	430	1,361	7,418	8,395
Sweden	2,281	5,837	2,821	1,894	2,387
Switzerland	440	835	513	713	--
United Kingdom	1,281	462	431	2,296	4,486
Yugoslavia	--	--	--	155	--
Hong Kong	20	331	258	1,095	--
India	12,011	6,299	5,113	15,219	18,254
Japan	20,503	17,765	28,111	27,109	28,317
South Korea	17,733	9,421	8,315	13,892	13,837
Singapore	--	155	771	569	--
Taiwan	7,739	13,231	14,023	18,151	24,153
Other Countries	3,408	62	186	2,798	2,252
Copper & Alloyed Foil	775	653	987	186	467
Canada	163	64	114	17	240
Honduras	--	--	--	--	20
Germany, F.R.	119	13	6	6	6
Netherlands	--	--	--	--	6
United Kingdom	--	9	--	--	7
Bahrain	--	--	--	--	3
Hong Kong	--	--	--	--	42
India	--	--	--	--	6
Japan	38	7	11	22	9
South Korea	--	7	9	6	7
Kuwait	--	--	--	--	31
Singapore	--	--	--	--	9
Taiwan	365	33	171	76	101
Thailand	--	--	--	--	19
United Arab Emirates	--	--	--	--	119
Other Countries	90	77	20	73	8

(continued)

TABLE XV (CONT)

	1982	1983	1984	1985	1986
Pipes & Tubes	5,047	3,991	4,270	5,004	5,890
Plates & Sheets	13,038	1,511	5,122	866	708
Unalloyed Copper Bars, Angles, Shapes, Sections & Rods	10,295	10,405	13,338	7,396	9,848
Wire & Cable, Bare	8,326	9,163	9,677	8,775	7,915
Insulated Wire & Cable (b	70,070	67,714	65,136	54,754	65,217
Building Wire & Cable	4,541	6,004	3,879	2,265	2,924
Power Wire & Cable	11,777	7,388	6,622	6,852	6,338
Communication Wire & Cable	22,625	23,825	21,211	13,489	21,304
Copper Magnet Wire	3,595	3,679	3,589	2,905	2,279
Appliance Wire & Cord	3,026	5,779	4,511	5,950	6,311
Other Insulated Wire & Cable	24,506	21,039	25,324	23,293	26,061
Blister Copper (c	1	--	--	7	4
Refined Copper (c)	1,178	718	2,006	16,736	692
Canada	1,156	661	9	12	27
Mexico	--	54	1,005	--	--
Brazil	--	--	--	369	--
Germany, F.R.	22	--	--	--	--
Netherlands	--	--	--	10,148	--
Japan	--	3	551	--	--
South Korea	--	--	--	--	665
Taiwan	--	--	441	--	--
China	--	--	--	6,207	--

Source: American Bureau of Metal Statistics Inc., U.S. Bureau of the Census. Current monthly data available, report 011, for the above table on an annual subscription basis.
(a Metal weight. (b Gross weight. (c Re-exports, imported foreign merchandise.

TABLE XVI

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1948	11,493	41,318,524	3,595	69.13	39,072,204
1949	11,001	40,612,224	3,692	71.00	37,365,611
1950	10,181	41,994,321	4,125	79.33	41,757,273
1951	10,754	47,825,698	4,447	85.52	42,784,388
1952	11,365	54,950,235	4,835	93.14	44,472,522
1953	12,068	62,742,982	5,199	99.98	45,187,838
1954	12,502	65,518,853	5,241	100.79	43,072,894
1955	12,399	71,293,263	5,750	110.58	52,189,728
1956	14,008	83,568,996	5,966	114.73	60,468,580
1957	14,652	85,125,320	5,809	111.71	59,571,834
1958	14,100	74,726,972	5,300	101.93	56,255,809
1959	11,568	72,095,130	6,232	119.85	53,121,545
1960	13,764	90,312,848	6,562	126.19	66,032,439
1961	14,275	97,271,286	6,814	131.04	71,918,991
1962	14,408	101,920,108	7,074	136.04	78,868,147
1963	14,303	104,291,588	7,292	140.23	80,615,132
1964	14,720	113,792,031	7,730	148.65	86,132,039
1965	15,239	122,163,124	8,016	154.16	92,859,535
1966	17,018	137,187,611	8,061	155.02	101,558,298
1967	13,426	108,427,206	8,076	155.31	74,289,203
1968	15,734	136,089,579	8,649	166.33	101,293,963
1969	19,459	173,183,018	8,900	171.15	127,848,828
1970	21,479	201,665,064	9,389	180.56	150,241,000
1971	21,231	211,978,597	9,984	192.00	149,294,000
1972	23,233	254,717,341	10,964	210.85	165,914,825 (2
1973	25,494	291,294,328	11,426	218.89	181,311,945
1974	27,894	340,832,096	12,219	234.98	178,913,296

(continued)

TABLE XVI (CONT)

"COVERED EMPLOYMENT" AND WAGES IN ARIZONA COPPER MINING AND SMELTING

Year	Average No. Covered Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage	Tons Copper Ore
1975	25,950	363,349,178	14,002	269.27	168,750,152
1976	25,631	405,289,034	15,812	304.08	194,136,559
1977	23,373	398,539,789	16,835	323.75	168,641,401
1978	21,092	397,790,419	18,860	362.69	178,204,491
1979	23,239	494,963,476	21,299	409.60	203,997,408
1980	21,602	510,168,454	23,617	454.17	169,650,401
1981	26,031	687,434,789	26,408	507.85	216,787,430
1982	17,182	487,415,292	28,368	545.53	135,768,647
1983	13,864	395,266,852	28,510	548.29	135,301,652
1984	12,556	387,028,537	30,824	592.77	145,278,431
1985	11,155	349,311,047	31,314	602.19	174,218,218
1986	10,848	326,915,975	30,136	579.54	167,808,000

Source: This report, Table XVII; "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines; Research and Statistics Unit, Arizona Department of Economic Security.

(1 "Covered Employment" by law includes all employees of employers of three or more persons. Prior 1966 only a portion of the workers in smelting, refining and rod fabrication were included in this table.

(2 Mine production in short tons of lode ore from "Arizona, Mine Production by Class of Ore", report by U.S. Bureau of Mines. In 1982 and thereafter the tonnage may include copper-zinc, copper-lead and lead-zinc ore combined to avoid disclosing individual company confidential data.

TABLE XVII

ARIZONA INDUSTRIES COVERED BY SOCIAL SECURITY

YEAR - 1986

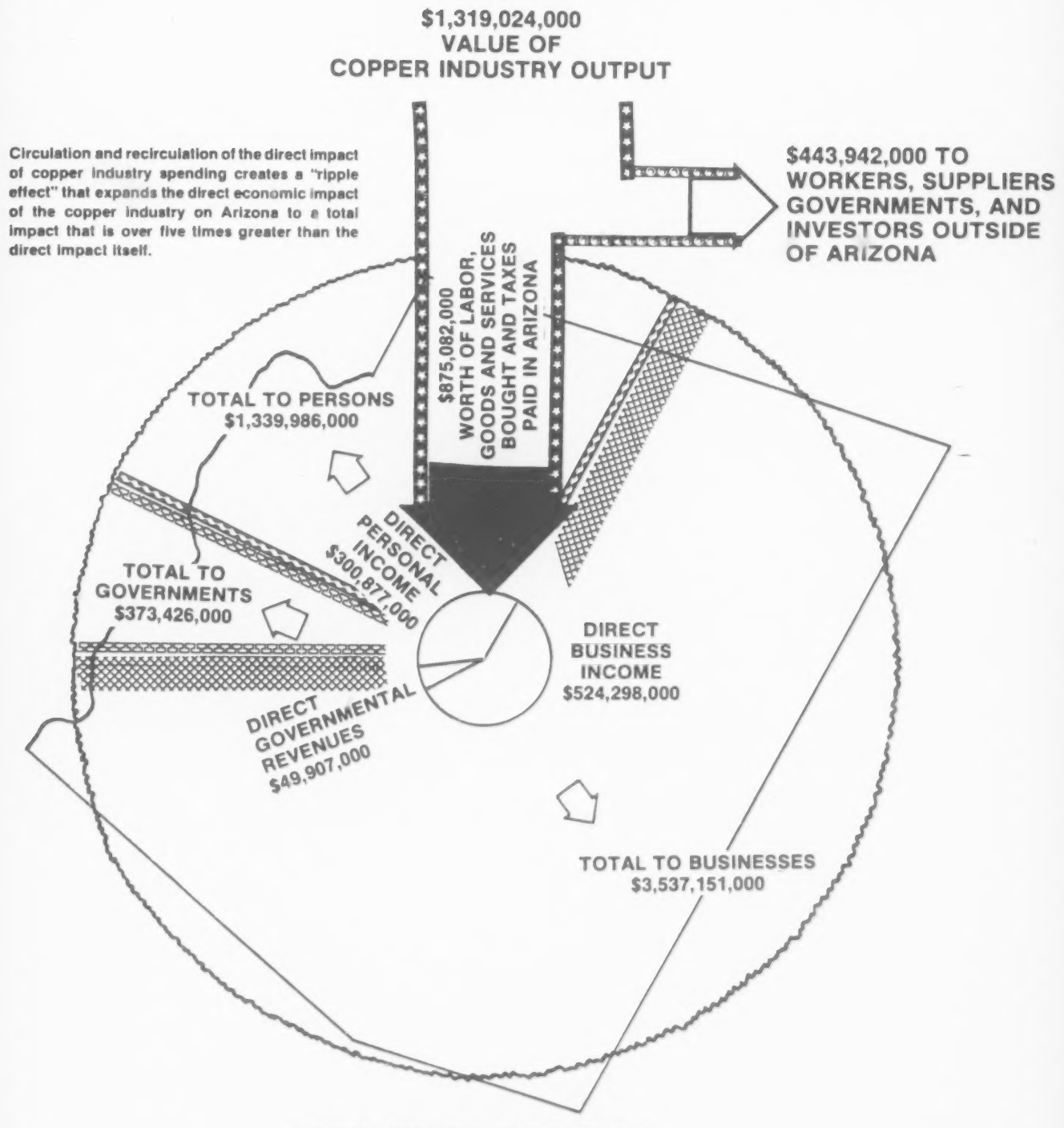
Industry	Average Number of Employees (1	Total Wages	Average Annual Wage	Average Weekly Wage
Copper Mining	8,692	263,225,648	30,284	582.38
Copper Smelting, Refining & Rod Fabrication	2,156	63,690,327	29,541	568.10
TOTAL COPPER MINING & PROCESSING	10,848	326,915,975	30,136	579.54
Other Mining, Quarrying & Processing	2,588	77,615,345	29,990	576.74
ALL MINING, QUARRYING & PROCESSING	13,436	404,531,320	30,108	579.00
Mfg. Except Copper Processing	183,972	4,549,703,166	24,730	475.58
Construction	112,898	2,325,439,463	20,598	396.11
Transportation, Utilities, etc. (2	57,356	1,431,254,729	24,954	479.88
Wholesale-Retail Trade	324,650	4,452,605,566	13,715	263.75
Services, Finance & Misc.	398,121	7,060,134,312	17,734	341.03
Agriculture & Related Services	30,659	350,100,557	11,419	219.60
Federal, State & Local Government	216,105	4,658,962,882	21,559	414.59
TOTAL AND AVERAGES	1,337,197	25,232,731,995	18,870	362.88

Source: Research Administration, Arizona Department of Economic Security

(1 Includes all covered employees.

(2 Transportation exclusive of railroads.

TABLE XVIII


$1,319,024,000
VALUE OF
COPPER INDUSTRY OUTPUT
Circulation and recirculation of the direct impact of copper industry spending creates a "ripple effect" that expands the direct economic impact of the copper industry on Arizona to a total impact that is over five times greater than the direct impact itself.
$443,942,000 TO WORKERS, SUPPLIERS GOVERNMENTS, AND INVESTORS OUTSIDE OF ARIZONA
$875,082,000 WORTH OF LABOR, GOODS AND SERVICES BOUGHT AND TAXES PAID IN ARIZONA
TOTAL TO PERSONS
$1,339,986,000
DIRECT PERSONAL INCOME
$300,877,000
TOTAL TO GOVERNMENTS
$373,426,000
DIRECT BUSINESS INCOME
$524,298,000
DIRECT GOVERNMENTAL REVENUES
$49,907,000
TOTAL TO BUSINESSES
$3,537,151,000
TOTAL IMPACT: $5,250,563,000

DIRECT AND INDIRECT IMPACTS OF THE COPPER INDUSTRY ON THE ARIZONA ECONOMY 1986

Source: "The Copper Industry's Impact on the Arizona Economy -- 1986" by George F. Leaming, Western Economic Analysis Center, Marana, AZ

TABLE XIX

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA (1

	All Employees		PRODUCTION WORKERS											
	Average No. (Thousands)		Average No. (Thousands)		Average Weekly Earnings		Average Weekly Hours		Average Hourly Earnings		Average Earnings Per Man Per Year		Aggregate Man Hours (Thousands)	
Period	(2 Ariz.	(3 U.S.	(4 Ariz.	(5 U.S.	Ariz.	U.S.	Ariz.	U.S.	(6 Ariz.	U.S.	(7 Ariz.	U.S.	(8 Ariz.	U.S.
1970	18.8	37.0	14.9	29.5	173.01	175.67	43.8	44.7	3.95	3.93	8,997	9,135	33,936	68,570
1971	18.9	34.7	14.9	26.8	178.50	178.46	42.4	42.9	4.21	4.16	9,282	9,280	32,852	59,785
1972	20.5	38.9	16.1	30.7	194.69	192.19	41.6	41.6	4.68	4.62	10,124	9,994	34,827	66,410
1973	21.5	42.3	17.6	33.7	206.75	206.42	41.6	42.3	4.97	4.88	10,751	10,734	38,072	74,127
1974	24.0	42.8	19.1	33.8	222.16	226.46	39.6	41.1	5.61	5.51	11,552	11,776	39,331	72,237
1975	22.5	37.1	17.9	28.4	247.43	247.14	38.6	39.2	6.41	6.33	12,866	12,903	35,929	57,891
1976	21.7	35.5	17.2	27.0	286.31	280.70	40.1	40.1	7.14	7.00	14,888	14,596	35,865	56,300
1977	19.3	35.1	15.3	26.9	302.99	288.73	39.4	38.6	7.69	7.48	15,755	15,014	31,347	53,994
1978	17.2	35.2	13.7	26.9	344.76	338.40	40.8	40.0	8.45	8.46	17,928	17,597	29,066	55,952
1979	19.3	31.9	15.3	24.6	404.81	405.03	42.3	42.5	9.57	9.53	21,050	21,061	33,654	54,366
1980	17.7	29.4	14.0	22.6	446.19	435.01	41.7	41.0	10.70	10.61	23,202	22,621	30,358	48,183
1981	21.9	36.2	17.4	27.9	497.28	492.54	41.2	41.6	12.07	11.84	25,859	25,612	37,278	60,353
1982	15.2	25.3	12.1	18.5	495.60	484.91	38.3	38.7	12.94	12.53	25,771	25,215	24,098	37,229
1983	11.3	18.9	9.0	13.5	519.25	522.69	39.1	39.9	13.28	13.10	27,001	27,180	18,299	28,010
1984	10.5	16.3	8.2	11.4	553.83	562.74	41.3	41.5	13.41	13.56	28,799	29,002	17,610	24,601
1985	9.4	13.1	7.5	9.4	573.80	574.76	41.4	42.2	13.86	13.62	29,838	29,888	16,146	20,627
1986	8.7	11.4	6.9	8.8	582.38	507.99	40.4	41.3	14.42	12.30	30,284	26,415	14,496	18,899

(continued)

TABLE XIX (CONT)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA (1

	Copper Ore Mined (Thousand Short Tons)		Copper Produced (Recoverable Content) (Thousand Pounds)		Worker Productivity Copper Ore Mined Per Man-Hour (Tons)		Worker Productivity Copper Produced Per Man-Hour (Pounds)	
Period	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.	Ariz.	U.S.
1970	150,241	257,729	1,826,734	3,368,957	4.427	3.759	53.829	49.132
1971	149,294	242,656	1,633,568	2,986,599	4.544	4.059	49.725	49.906
1972	165,815	266,831	1,816,118	3,264,113	4.761	4.017	52.161	49.191
1973	173,605	289,990	1,847,635	3,386,357	4.872	3.912	48.530	45.683
1974	178,821	293,443	1,710,744	3,145,148	4.547	4.062	43.496	43.539
1975	168,656	263,003	1,619,535	2,772,111	4.694	4.543	45.076	47.885
1976	194,046	283,736	2,043,168	3,166,889	5.410	5.040	56.968	56.250
1977	168,601	259,974	1,843,949	2,964,539	5.379	4.815	58.828	54.909
1978	178,201	263,722	1,965,072	2,955,210	6.131	4.713	67.607	52.817
1979	203,977	291,078	2,085,556	3,140,110	6.061	5.369	61.971	57.758
1980	169,650	241,090	1,669,495	2,527,920	5.588	5.004	54.994	52.465
1981	216,787	306,089	2,294,437	3,354,548	5.815	5.072	61.549	55.582
1982	146,125	200,589	1,697,500	2,507,070	6.064	5.388	70.442	67.342
1983	152,902	196,203	1,514,538	2,288,612	8.356	7.005	82.766	81.707
1984	145,278	189,499	1,583,505	2,405,866	8.250	7.703	89.921	97.795
1985	174,218	239,399	1,778,334	2,443,675	10.790	11.606	110.141	118.479
1986	167,808	186,105	1,752,525	2,361,127	11.576	9.847	120.897	129.934

Source: Table I this publication, Arizona Department of Economic Security, American Bureau of Metal Statistics and U.S. Bureau of Mines.

(continued)

TABLE XIX (CONT)

EMPLOYMENT, EARNINGS AND HOURS IN COPPER MINING

IN THE UNITED STATES AND ARIZONA (1

(1 Statistics do not reflect workers in copper smelting, refining and rod fabrication.

(2 These figures are estimates made by the Arizona Department of Economic Security, in cooperation with the U.S Bureau of Labor Statistics, and they include all full and part-time wage and salary workers who were employed in copper mining in any part of the pay periods which included the 12th of each month of the year.

(3 Estimates made by the U.S. Bureau of Labor Statistics, in cooperation with the 50 states, and based upon monthly samplings similar to those in (2 above, adjusted periodically to census bench mark.

(4 Estimates of production (non-supervisory) workers based upon samplings as in (2 above. Since 1975, figures have been calculated by the Arizona Department of Mines and Mineral Resources dividing the annual number of "All Employees-Arizona" by a factor of 1.26. This factor was derived by comparing the annual number of "All Employees-Arizona" with "Production Workers - Arizona" from 1970 to 1974.

(5 Earnings figures for a particular year is the product of "Average Hourly Earnings" and "Average Weekly Hours" for that year.

(6 Gross payroll aggregates, exclusive of irregular bonuses and other pay not earned in a sample pay period, are divided by gross man-hour aggregates of production and related workers for the period in order to determine average hourly earnings.

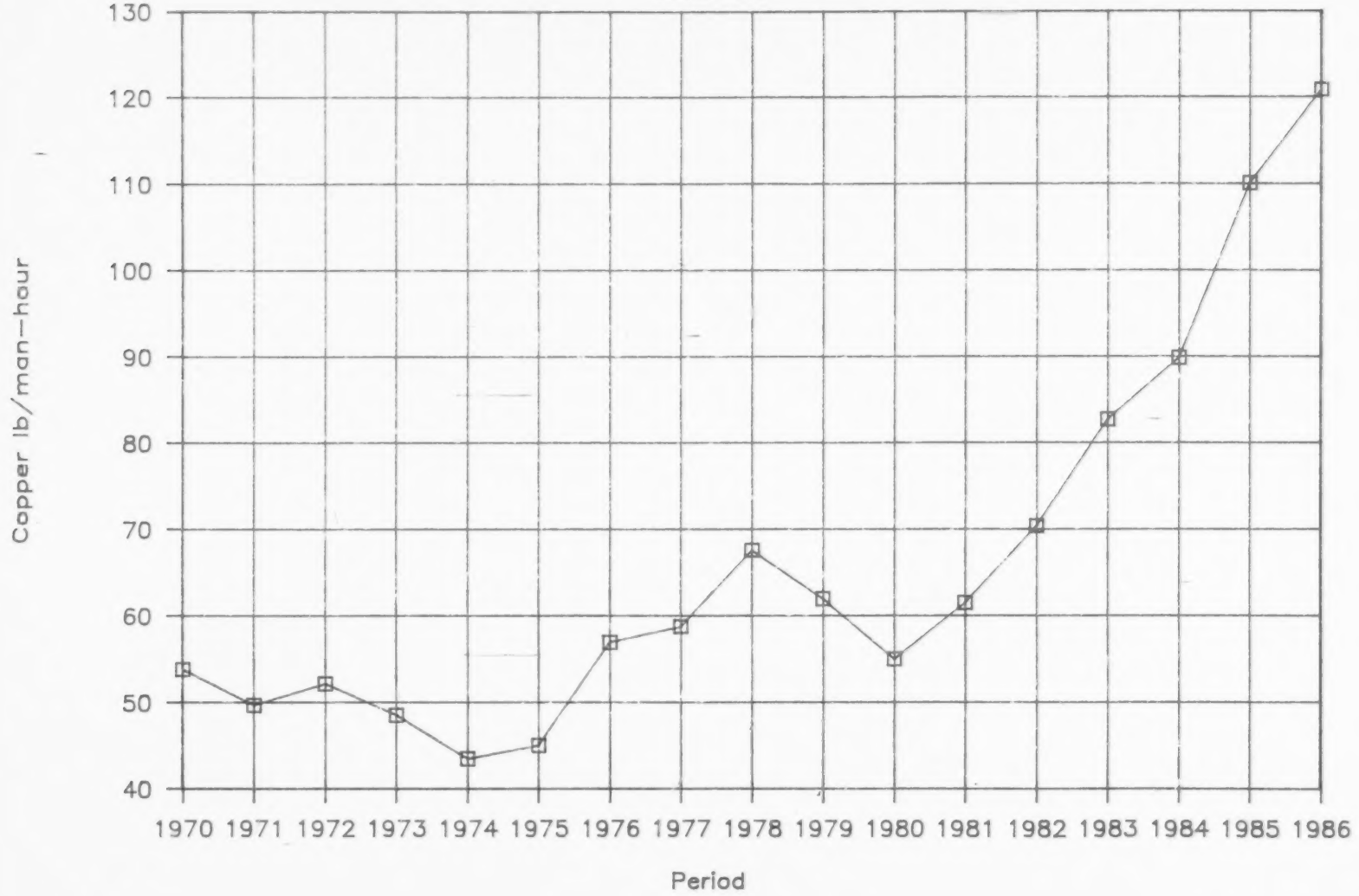
(7 "Average Weekly Earnings" times 52 weeks.

(8 Number of production workers times "Average Weekly Hours" times 52 weeks.

Source: Research and Statistics Unit, Arizona Department of Economic Security: "Minerals Yearbook - Metals, Minerals", U.S. Bureau of Mines. "Employment and Earnings", March issues, U.S. Department of Interior

Productivity of Arizona Copper Workers

Table XIX



COPPER PRODUCED (RECOVERABLE CONTENT)

TABLE XIX

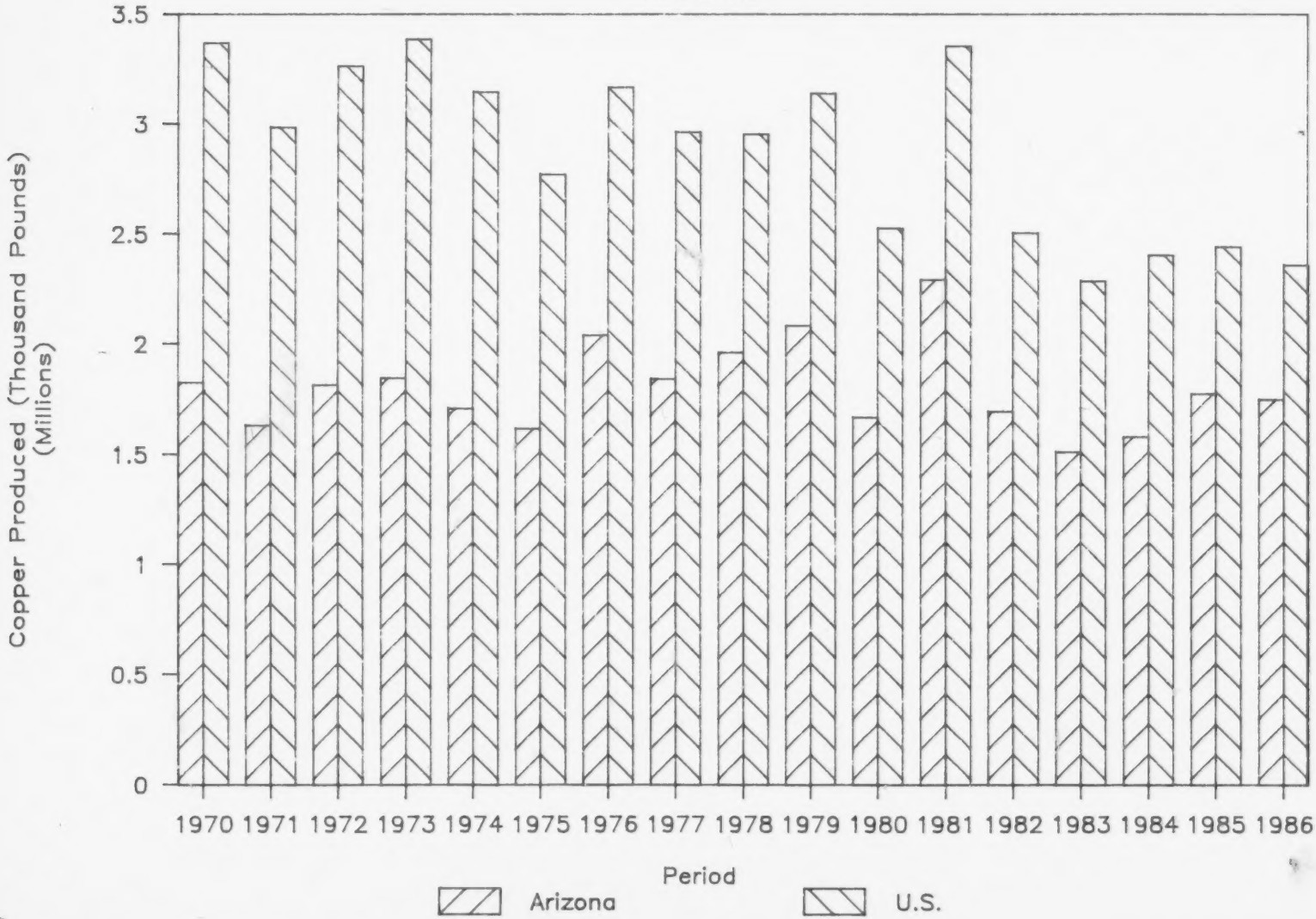


TABLE XX

REFINED COPPER INVENTORIES AT YEAR END
AMOUNTS IN THOUSANDS OF SHORT TONS

Where Held	1982	1983	1984	1985	1986
U.S. refineries	210.1	66.1	193.4	150.4	145.1
Comex warehouses	274.4	409.2	276.3	120.3	93.3
Total U.S.	484.5	475.3	469.7	270.7	238.4
Refineries elsewhere	420.8	352.6	285.7	293.7	277.1
LME warehouses	279.1	480.2	139.3	209.1	193.1
Total elsewhere	699.9	832.8	425.0	502.8	470.2
Aggregate inventories	1184.4	1308.1	894.7	773.5	708.6

Source: American Bureau of Metal Statistics. All figures for December 31.

TABLE XXI
AVERAGE QUOTED PRICE OF
ELECTROLYTIC COPPER WIREBAR
DOMESTIC, DELIVERED
U.S. /lb. (1

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
JANUARY	66.240	62.625	76.574	119.385	88.570	78.634	80.219	68.792	64.487	69.881
FEBRUARY	68.625	63.593	89.697	133.808	86.071	78.779	84.024	70.748	66.446	68.253
MARCH	72.551	62.410	96.718	106.040	87.382	75.862	82.072	75.311	65.547	70.144
APRIL	74.393	64.625	98.322	94.851	88.033	76.273	83.493	77.388	70.318	68.801
MAY	72.606	64.768	91.234	93.479	85.798	77.948	85.634	72.229	69.864	67.082
JUNE	71.199	66.569	88.241	92.713	85.226	71.488	81.836	69.849	67.094	67.471
JULY	67.996	64.079	86.768	103.565	84.412	71.053	82.947	64.402	66.773	63.815
AUGUST	63.792	67.232	91.335	100.708	87.387	70.999	80.542	64.535	66.284	62.374
SEPTEMBER	60.625	67.632	95.853	98.864	84.722	71.065	77.587	63.408	65.716	64.844
OCTOBER	60.625	70.495	99.106	99.471	82.312	72.413	73.392	62.039	66.680	63.464
NOVEMBER	60.625	71.191	99.708	96.982	81.216	72.968	69.581	65.650	66.294	62.855
DECEMBER	61.942	71.897	106.448	89.127	80.293	74.230	70.805	63.538	68.025	63.630

Source: Metals Week

(1 MW US Producer Delivered.

Prepared by: State of Arizona Joint Legislative Budget Committee Staff.

TABLE XXII

AVERAGE COPPER CASH PRODUCTION COSTS FOR THE UNITED STATES, 1981-85 (1

(Cents per pound of copper)

PRODUCT COSTS	1981	1982	1983	1984	1985 (6	Long run (2
Mine op. cost	32	26	22	20	23	26
Mill-Float op. cost	27	24	24	23	20	22
Mill-Leach op. cost	8	9	7	7		5
Smelt/Refine/Transportation	28	28	26	24	23	24
Taxes (3	3	3	3	2	2	3
Total Cost	98	90	82	76	68	80
Byproduct Credits	(19)	(13)	(13)	(11)	(9)	(11)
Cash Cost (4	79	77	69	65	59	69
Production Thousand Short Tons (5 of Copper	1,365	989	1,027	1,105 (e		1,504

(e Estimated.
(1 Includes 16 mines, most of which were producing from 1981 to 1984.
(2 Long run costs include depreciation allowances to sustain production.
(3 Property and severance taxes and royalties, if applicable.
(4 Includes all cash cost of production and credit for byproducts but excludes depreciation and profit (except long run costs). Costs are in actual dollars for each year shown.
(5 Based on the production of the 16 mines analyzed. Long run production is estimated full capacity level. Capacities are averaged over the life of the mine.
(6 Includes 13 mines. Mill costs are combined in 1985.

Source: U.S. Bureau of Mines Preprint from Bulletin 675 Chapter on Copper. Mineral Facts and Problems, 1985 Edition and 1985 Minerals Yearbook.

TABLE XXIII

COPPER RESERVE BASE IN ARIZONA (1

COMPANY	DEPOSIT	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ANTIOCH RESOURCES	Zonia	Oxide	35	0.31	Unpublished estimate.
ASARCO INC.	Mission Complex	Sulfide	276	0.62	With 0.13 oz/ton Ag. Pub. ASARCO 1986 Annual Report.
	Poston Butte	Mixed	32	0.47	Pub. 1984 E&MJ 1972.
	Ray	Mixed	695	0.71	Pub. ASARCO 1986 Annual Report.
	Sacaton East (UG)	Sulfide	16	1.20	Pub. in ASARCO Inc. 1983 Annual Report.
	Silver Bell	Sulfide	21	0.68	With .07 oz/ton Ag. Pub. in 1986 Annual Report.
BS & K MINING CO.	Atlas	Sulfide	5	0.64	Brochure - 1987.
		Oxide	5	0.37	
BUYERS TITLE AND TRUST CO.	Helvetia	Sulfide	320	0.64	Pub. 1973; cutoff at 0.3% Cu.
	Helvetia	Oxide	20	0.55	Pub. 1973; acid soluble Cu; cutoff at 0.3% acid soluble Cu.
	Twin Buttes	Sulfide	106	0.69	Pub. in Amax Inc. 1984 Annual Report.
	Twin Buttes	Oxide	16	0.82	Pub. in Amax Inc. 1984 Annual Report.
CASA GRANDE COPPER CO.	Casa Grande	Mixed	352	1.00	Pub. in Getty Oil Co. 1980 Annual Report.
CF & I STEEL CORP.	Dragoon	Oxide			Withheld by request.
COCHISE MINING CORP.	San Juan	Oxide	20	0.50	Unpublished estimate.
CONOCO INC.	Poston Butte	Mixed	800	0.40	Pub. 1979 from Copper Studies Inc.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

COMPANY	DEPOSIT	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
CYPRUS MINES CORP.	Bagdad	Sulfide	306	0.50	With 0.018% Mo.
	Bagdad	Oxide	38	0.33	Acid soluble Cu.
	Esperanza	Sulfide	48	0.27	With .034% Mo.
	I-10	Mixed	100	0.52	Unpublished estimate; with 0.02% Mo.
	Lakeshore	Sulfide (Porphyry)	41	0.65	Pub. in Noranda's 1984 Annual Report.
	Lakeshore	Sulfide (Tactite)	9	1.35	Pub. in Noranda's 1984 Annual Report.
	Lakeshore	Oxide	13	1.16	Pub. in Noranda's 1984 Annual Report.
	Mineral Park	Sulfide	35	0.17	With .054% Mo.
	Sierrita	Sulfide	257	0.30	With .035% Mo. Pennzoil 1981 10K Report
	Ventura	Sulfide	6	0.26	Reported 1965; with 0.28% MoS
DORE MINING & MILLING	Four Metals	Sulfide	3	0.82	Reported 1965.
DURHAM, A. ET. AL.	Strong & Harris	Mixed	60	0.60	Unpublished estimate with 0.70% Zn.
FREEPORT MCMORAN	Santa Cruz	Oxide	800	0.43	50% joint venture with ASARCO
HARPOON, INC.	Sanchez	Oxide	116	0.37	Unpublished report.
HOPE MINING & MILLING CO.	Mame	Oxide	2	1.00	Unpublished estimate.
INSPIRATION CONSOLIDATED COPPER CO.	Christmas (OP)	Sulfide	7	0.63	Pub. in Inspiration Resources 1983 Form 10-K, p. 8.
	Christmas (UG)	Sulfide	20	1.82	(Same as above)
	Inspiration Area Mines	Mixed	222	0.52	Pub. in Insp. Res. 1985 Form 10-K.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

COMPANY	DEPOSIT	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
KENNECOTT	Chilito	Mixed			Withheld by request.
	Lone Star	Mixed	1065	0.58	World Mining, May 1981.
KERR McGEE CORP.	Red Mountain	Sulfide	100	0.71	Pub. 1970; 100 million tons possible.
KEYSTONE MINERALS INC.	Korn Kob	Oxide	8	0.50	Pub. in "Pay Dirt" July 1973.
KOCIDE CHEMICAL	Van Dyke	Oxide	100	0.50	Pub. 1977.
MAGMA COPPER CO.	Copper Creek	Sulfide			Withheld by request.
	Kalamazoo	Sulfide	254	0.71	Proven & probable; 1985 Newmont Annual Report; 0.029 oz/ton Ag.
	Kalamazoo	Sulfide shaft pillar	101		1985 Newmont Annual Report.
	Miami East	Sulfide	6	3.14	Pub. in Newmont Mining 1985 Annual Rpt.
	Pinto Valley	Sulfide	355	0.40	Pub. in Newmont Mining 1985 Annual Rpt.
	San Manuel	Sulfide	194	0.69	Proven & probable; 1985 Newmont Annual Report; 0.029 oz/ton Ag.
		Sulfide shaft pillar	103		1984 Newmont Annual Report.
		Oxide	56	0.47	Proven & probable; 1985 Newmont Annual Report.
		Oxide (Subsidence Area)	170	0.36	1985 Newmont Annual Report.
	Superior	Sulfide	4	5.69	Proven & probable; 1984 Newmont Annual Report; 0.71 oz/ton Ag. (Written off 1985)
NAVAJO TRIBE (?)	White Mesa	Oxide	2	0.75	Pub. 1955.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

COMPANY	DEPOSIT	MAJOR MINERAL TYPE	MILLIONS OF TONS	AVERAGE Cu CONTENT	REMARKS/SOURCE
ORACLE RIDGE MINING PARTNERS	Oracle Ridge	Mixed (?)	11	2.50	Reported 1977; with 0.64 oz/ton Ag. Published 1979.
OWENS, S.B.	Carlota	Oxide	4	0.85	Reported 1979.
PALO SECO CORP.	Peach Elgin	Mixed	23	0.75	Pub. 1973; cutoff at 0.4% Cu.
PAPAGO TRIBE	Vekol Hills	Sulfide	105	0.56	Pub. 1978, minable by open pit, with 0.014% Mo; 16 million tons oxide Cu.
PHELPS DODGE CORP.	Bisbee North	Oxide	170	0.50	
	Copper Basin	Sulfide	175	0.55	Pub. 1974; minable by open pit with 0.02% Mo.
	Morenci/Metcalf	Sulfide	794	0.77	1986 Annual Report. With Sumitomo's 15% added.
	New Cornelia	Sulfide	209	0.50	1986 Annual Report.
	Safford	Mixed	232	0.89	1986 Annual Report.
	Western Copper	Sulfide	184	0.64	1986 Annual Report. With Sumitomo's 15% added.
SANTA FE MINING	Turquoise	Oxide	10	0.50	Pub. 1975 by Union Oil.
SMITH, V.A. - ESTATE	Dynamite	Mixed	100	0.53	Unpublished estimate.
SQUAW PEAK COPPER	Squaw Peak	Sulfide	30	0.35	Unpublished estimate.
STANDARD METALS CORP.	Antler	Sulfide	5	1.95	With 4.13% Zn, 0.94% Pb, and 1.05 Ag oz/ton. Pub. in 1978 Annual Report & Form 10-K.
STEWART TITLE AND TRUST & TSC ENTERPRISES	Emerald Isle	Oxide	1	0.40	3 million tons at 0.1% Cu USBM RI 8236, Pub. 1977.

(continued)

TABLE XXIII (CONT)

COPPER RESERVE BASE IN ARIZONA (1

TOTAL COPPER RESERVE BASE IN ARIZONA

Sulfide	4.1	Billion	tons at	0.62%
Oxide	1.5	"	"	0.44%
Mixed	3.7	"	"	0.63%
TOTAL	9.3	"	"	0.59% or 55 million tons of Copper

(1 **Reserve Base** -That part of an identified resource that meets specified minimum physical and chemical criteria related to current mining and production practices, including those for grade, quality, thickness, and depth. The reserve base is the in-place demonstrated (measured plus indicated) resource from which reserves are estimated. It may encompass those parts of the resources that have a reasonable potential for becoming economically available within planning horizons beyond those that assume proven technology and current economics. The reserve base includes those resources that are currently economic (reserves), marginally economic (marginal reserves), and some of those that are currently subeconomic (subeconomic resources).
"Mineral Facts and Problems" 1985 Edition, Bureau of Mines Bulletin 675, page 3

TABLE XXIV

ARIZONA AND U.S. COPPER MINE PRODUCTION IN SHORT TONS OF Cu, 1874-1986

Period	AZ Production (1	Cumulative AZ	U.S. Production (1	Cumulative U.S.	Ann'l	AZ % of US Prod. Cum
1874-1971*		24,889,171		60,365,183		41.2
1972	847,929	25,737,100	1,664,840	62,030,023	50.9	41.5
1973	867,506	26,604,606	1,717,940	63,747,963	50.5	41.7
1974	804,904	27,409,510	1,597,002	65,344,965	50.4	41.9
1975	751,489	28,160,999	1,413,366	66,758,331	53.2	42.2
1976	956,215	29,117,214	1,605,586	68,363,917	60.0	42.6
1977	852,620	29,969,834	1,503,964	69,867,887	56.7	42.9
1978	908,835	30,878,669	1,496,482	71,364,363	60.7	43.3
1979	957,251	31,835,920	1,591,200	72,955,563	60.2	43.6
1980	760,926	32,596,846	1,301,900	74,257,463	58.4	43.9
1981	1,071,949	33,668,795	1,695,500	75,952,963	63.2	44.3
1982	848,750	34,517,545	1,264,322	77,217,285	67.1	44.7
1983	747,604	35,265,149	1,144,306	78,361,591	65.3	45.0
1984	822,815	36,087,964	1,215,400	79,576,991	67.7	45.3
1985	878,044	36,966,008	1,218,900	80,795,891	72.0	45.8
1986 (Prelim)	878,926	37,844,934	1,296,300	82,092,191	67.8	46.1

* For Cumulative Breakdown 1874-1911 and Annual Production 1912-1971, see "The Copper Industry" by Ken Phillips, published Feb. 1973 by ADMMR.

(1 Source: "Mineral Yearbook - Area Reports: Domestic", U.S. Bureau of Mines.

THE ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

The Department's objective is to promote the development of Arizona's mineral resources. This is accomplished through technical research, field investigations, compilation of information into a mineral occurrence data base and disseminating information through publications, personal contacts and seminars.

The Department's mining engineers and geologists assist mining and exploration companies, prospectors and others interested in Arizona's minerals with mineral processing, mineral land acquisition, exploration, mine development, financing, government regulations and marketing.

The Department is a service agency and does not regulate, tax, or require any type of registration. The agency provides many different services tailored to meet the differing needs of the public. The following is a partial list of services which the Department offers:

- Maintain a site specific data base of unpublished reports and maps which includes 5,000 mine files and indexes of 10,000 computerized Arizona mineral locations.

- Maintain an information bank and library of mineral and mining information including a mine map library (hard copy and microfilm), government publications, periodicals, and unpublished master and doctorate theses.

- Gather and disseminate information on commodities and markets.

- Suggest target areas for possible exploration activity.

- Suggest prospects and individual properties for study and acquisition.

- Assist individuals and companies in their dealings with State regulatory agencies to facilitate their mining and exploration activity.

- Produce publications in the form of mineral reports, annual directories, technical reports, annual mineral industry surveys and information circulars. These include *Laws and Regulations Governing Mineral Rights in Arizona, Directory of Exploration Offices in Arizona, Manual for Determination of Status and Ownership of Arizona Mineral and Water Rights,* and others. A current listing of the Department publications is available upon request.